

February 25, 2008

TO: Members of the MAG Specifications and Details Committee

FROM: Robert Herz, Maricopa County DOT, Chairman

SUBJECT: MEETING NOTIFICATION AND TRANSMITTAL OF AGENDA

Wednesday, March 5, 2008 at 1:30 p.m.
MAG Office, Second Floor, Cholla Room
302 North First Avenue, Phoenix

The meeting of the MAG Specifications and Details Committee will be held at the place and time indicated above. The agenda for the meeting is provided below. **Please park in the garage under the building. Bring your ticket to the meeting, parking will be validated. For those using transit, the Regional Public Transportation Authority will provide transit tickets for your trip. For those using bicycles, please lock your bicycle in the bike rack in the garage.** Please call me at (602) 506-4760 if you have questions about the upcoming meeting.

Pursuant to Title II of the Americans with Disabilities Act (ADA), MAG does not discriminate on the basis of disability in admissions to or participation in its public meetings. Persons with a disability may request a reasonable accommodation, such as a sign language interpreter, by contacting Gordon Tyus at the MAG Office at (602) 254-6300. Requests should be made as early as possible to allow time to arrange the accommodation.

AGENDA

<u>ITEM</u>	<u>COMMITTEE ACTION REQUESTED</u>
1. <u>Call to Order</u>	1. No action required.
2. <u>Approval of Feb 6, 2008 Meeting Minutes</u>	2. Corrections and approval of Feb 6, 2008 minutes.
3. <u>2007 & 2008 Cases</u>	3. Review of pending cases and submission of new cases for consideration.
4. <u>General Discussion</u>	4. For information and discussion.
5. <u>Adjournment</u>	5. No action required.

MEETING MINUTES FROM THE
MARICOPA ASSOCIATION OF GOVERNMENTS
STANDARD SPECIFICATIONS AND DETAILS COMMITTEE

February 6, 2008

Maricopa Association of Governments Office, Cholla Room
302 North First Avenue
Phoenix, Arizona

AGENCY MEMBERS

- | | |
|----------------------------|--------------------------------------|
| Jim Badowich, Avondale | Gordon Haws, Mesa |
| * Steven Borst, Buckeye | * Jesse Gonzalez, Peoria |
| Sheina Hughes, Chandler | Jeff Van Skike, Phoenix (St. Trans.) |
| * Chris Young, El Mirage | Jami Erickson, Phoenix (Water) |
| * Kelli Kurtz, Gilbert | * Gerald Wright, Queen Creek |
| Tom Kaczmarowski, Glendale | * Rodney Ramos, Scottsdale |
| Troy Tobiasson, Goodyear | Loren Kelley, Surprise |
| Bob Herz, MCDOT | James Bond, Tempe |

ADVISORY MEMBERS

- | | |
|--|------------------------------|
| John Ashley, ACA | * Adrian Green, ARPA |
| Jeff Benedict, AGC | Paul R. Nebeker, Independent |
| Brian Gallimore, AGC | * William Ast, NUCA |
| Peter Kandarlis, SRP, Vice Chairman | Dale Phelan, NUCA |
| James Carusone for Don Cornelison,
ARPA | |

MAG ADMINISTRATIVE STAFF

Gordon Tyus

- * Members not attending or represented by proxy.

GUESTS/VISITORS

Tiffany Ward, Hansen Pipe and Precast
Denny Galvin, ADS

1. Call to Order

Chairman, Bob Herz, called the meeting to order at 1:35 p.m.

2. Approval of Minutes

The members reviewed the January 2, 2008 meeting minutes. Jeff Van Skike introduced a motion to accept the minutes as written. John Ashley seconded the motion. A voice vote of all ayes and no nays was recorded.

3. 2007 Cases (old cases)

a. **Case 07-02 – Revisions to Asphalt Concrete, Sections 321 and 710:** Major re-writes of Asphalt Concrete placement and materials Sections 321 and 710 as proposed by the Asphalt Paving Technical Committee (APTC). Jeff Benedict gave a progress report on recent committee meetings for resolving comments. The technical committee expects to finish resolving Section 321 comments at the next subcommittee meeting and will begin work on Section 710 comments (copy handed out). APTC will meet at the ARPA offices (916 W. Adams Street, Phoenix) on February 13th to continue the work.

b. **Case 07-03A – PVC Catch Basins, Proposed New Details 535-2, 535-3, & 537-2. Case 07-03B – Inlet Structures, Proposed New Details 539-2, 542-1 through 4 & 543-1 through 5:** Details to allow the use of PVC catch basins and inlet structures. Peter Kandarlis provided written comments that summarized a number of changes recommended during previous meetings. Committee members discussed these comments and also recommended including dimensioning and slopes on catch basin concrete slabs, including a water stop when referencing MAG Detail 505, specifying pipe class for basins materials, including a note referencing invert elevations per project plans, and including the word “shall” for the first note on details that reference required load ratings. Dale Phelan will prepare revisions addressing comments and discussion items for the next meeting.

c. **Case 07-08 – Revision to Section 615.2, Sewer Line Construction:** Provide water ponding tolerances inside sewer pipe. Gordon Haws recommended keeping trenching tolerances in the existing section and adding tolerances for video inspection. Paul Nebeker identified the need for video measurement calibration standards. It was agreed that the various methods and equipment used by video firms should be examined before final establishment of tolerances and requirements. Jami Erickson requested revisions include the option for agencies to perform video tests and noted that the City of Phoenix has less stringent tolerances than those proposed. She will provide the committee with COP standards and tolerances. Bob Herz will contact Gerald Wright of Queen Creek to determine his status with the committee so that the case can move forward.

d. **Case 07-11 – Revision to Detail 370, Vertical Realignment of Water Mains:** Include an option for realignment of ductile iron mechanical joint. The committee had no discussion on this item.

e. **Case 07-12 – Revision to Detail 404-2, Water & Sanitary Sewer Separation/Protection:** Adding language to clarify the location of pipe and joint

restraints to insure that fittings/couplings do not fail and create cross-contamination. The committee had no discussion on this item.

4. 2008 Cases (new cases)

a. **Case 08-01 – Revisions to Borrow Excavation, Section 210:** Defining acceptance criteria for import borrow material. Peter Kandarlis provided written suggestions to include liquid limit and compaction performance requirements (in terms of fill stability and moisture content). Gordon Haws initiated a discussion on the requirements of on-site fill and whether on-site and import borrow should have the same requirements. Bob Herz will review comments and have responses or modifications for the next meeting.

b. **Case 08-02 – New Section 317, Asphalt Milling:** Construction requirements for milling existing asphalt concrete pavement (a new section as requested by the supplements subcommittee). Peter Kandarlis provided written suggestions to include equipment, dust control compliance, and milling operation requirements. The committee also discussed items including dust control and general clean up requirements, debris removal in relation to asphalt overlay construction time frames, including a section to deal with delamination of exiting pavement, insuring the new specification remains performance-based, and including repair methods for milling damage to underlying pavements. Bob Herz will review comments and have responses or modifications for the next meeting.

c. **Case 08-03 – New Section 325, Asphalt – Rubber Concrete Overlay, Gap Graded:** Material and construction requirements for gap-graded asphalt-rubber concrete used as an asphalt pavement overlay (a new section as requested by the supplements subcommittee). No comments were provided at this time. Committee members were requested to continue reviewing the proposal and return with comments for the next meeting.

d. **Case 08-04 – New Details 180-1 & 180-2, Portable Water Tank Fill Pipe and Backflow Prevent Details:** Approved methods for filling portable water tanks and trucks (a new section as requested by the supplements subcommittee). Jeff Van Skike initiated a discussion on whether these methods should be included in the MAG standards since they are not construction or material requirements. During the discussion, it was noted that details need to state that methods referenced apply only to potable water sources. Committee members were requested to continue reviewing the proposal and return with comments for the next meeting.

e. **Case 08-05 – Revisions to Safety Post Detail 140:** A revision to incorporate multiple agency safety post designs and include hazard marker requirements with the existing safety post detail (a new section as requested by the supplements subcommittee). Peter Kandarlis provided written comments to simplify multiple safety post details and examine more uniform post height requirements (relating post size to function). SRP also recommends excluding marker placement requirements since use and application are usually agency-specific or job-specific. Jeff Van Skike suggested that marker and post

reflective tape materials be researched to insure that materials specified meet the latest requirements. Sheina Hughes will review comments and have responses or modifications for the next meeting.

f. **Case 08-06 – Modification to Storm Drain Construction, Section 618.3:** A new section as requested by the supplements subcommittee to reduce the number of agency supplements to MAG standards. Jeff Van Skike presented additions to Section 618.3 to include leakage test procedures for HDPE storm drain pipes and require video inspection before final paving is allowed. Dale Phelan commented that video inspection requirements should be for all pipe types, not just HDPE. Committee members were requested to review the proposal and return with comments for the next meeting.

g. **Case 08-07 – Modification to Measurements and Payment, Section 109:** Revisions as requested by the supplements subcommittee to reduce the number of agency supplements to MAG standards. Gordon Haws presented changes to compensation requirements (part of City of Mesa supplements). Committee members were requested to review the proposal and return with comments for the next meeting.

h. **Case 08-08 – Modification to Subgrade and Trench Compaction, Sections 301.3 and 601.4:** Revisions as requested by the supplements subcommittee to reduce the number of agency supplements to MAG standards. Gordon Haws presented changes to include a moisture content range for subgrade and trench compaction and modify minimum compacted density for subgrade compaction (part of City of Mesa supplements). Committee members were requested to review the proposal and return with comments for the next meeting.

i. **Case 08-09 – Modification to Sewer Manhole Construction, Subsection 625.3.1:** Revisions as requested by the supplements subcommittee to reduce the number of agency supplements to MAG standards. Gordon Haws presented additions to sewer manhole frame and cover construction (part of City of Mesa supplements). Committee members were requested to review the proposal and return with comments for the next meeting.

j. **Case 08-10 – Modification to Trench Backfill and Pavement Replacement, Detail 200, Section 336 and Section 601:** Revisions as requested by the supplements subcommittee to reduce the number of agency supplements to MAG standards. Peter Kandarlis presented revisions that would eliminate numerous agency trench backfill and pavement replacement supplemental details by combining the most common practices into the revisions. Committee members were requested to review the proposal and return with comments for the next meeting.

5. General Discussion:

John Ashley handed out an update on the progress of the supplements subcommittee. He also requested the committee authorize ACA and ARPA to sponsor a new subcommittee to work

on modernization of MAG concrete specifications (Section 725). John stated he would be contacting committee members later this month to help with the subcommittee.

Gordon Tyus requested electronic versions of all new cases and member written comments. He also mentioned that the February 2008 edition of MAGAZine included an article highlighting the MAG Specifications and Details Committee's work.

Bob Herz noted that Steve Borst contacted him and is willing to help with any proposed revisions to water line specifications or details.

6. Adjournment:

The meeting was adjourned at 3:28 p.m.

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Page 1 of 4
February 11, 2008

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February 11, 2008

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February 11, 2008

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February 11, 2008

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2008 PROPOSED REVISIONS TO MAG SPECIFICATIONS AND DETAILS

Page 1 of 2

CASE	DESCRIPTION	PROPOSED BY	MEMBER	SUBMITTAL DATE Last Revision	VOTE DATE	VOTE
07-02	Revision/ Re-Write Section 710 & Section 321	ARPA AGC	Don Green Jeff Benedict	2/07/2007 2/06/2008		0 Yes 0 No 0 Abstain
07-03 A	PVC Catch Basins - New Details 535-2, 535-3, 537-2, 539-2	NUCA	Dale Phelan	2/07/2007 2/06/2008		0 Yes 0 No 0 Abstain
07-03 B	PVC Inlet Structures - New Details 542-1, 542-2, 543-1, 543-2, 543-5.	NUCA	Dale Phelan	2/07/2007 2/06/2008		0 Yes 0 No 0 Abstain
07-08	Revision to Section 615 Sewer Line Construction – Clarify tolerances for pipe versus trench bottom.	Queen Creek	Gerald Wright	5/02/2007 8/01/2007		0 Yes 0 No 0 Abstain
07-11	Revision to Detail 370, Vertical Realignment of Water Mains	Peoria	Jesse Gonzalez	6/06/2007		0 Yes 0 No 0 Abstain
07-12	Revision to Detail 404-2, Water & Sanitary Sewer Separation/Protection	Peoria	Jesse Gonzalez	6/06/2007		0 Yes 0 No 0 Abstain
08-01	Revision to Section 210 Borrow Excavation	MCDOT	Bob Herz	1/02/2008		0 Yes 0 No 0 Abstain
08-02	New Section 317, Asphalt Milling	MCDOT	Bob Herz	1/02/2008		0 Yes 0 No 0 Abstain
08-03	New Section 325, Asphalt – Rubber Concrete Overlay, Gap Graded	MCDOT	Bob Herz	1/02/2008		0 Yes 0 No 0 Abstain
08-04	New Details 180-1 and 180-2, Portable Water Tank Fill Pipe and Backflow Prevent Details	Chandler	David Fern	1/02/2008		0 Yes 0 No 0 Abstain
08-05	Revisions to Safety Post Detail 140	Chandler	David Fern	1/02/2008		0 Yes 0 No 0 Abstain

2008 PROPOSED REVISIONS TO MAG SPECIFICATIONS AND DETAILS

Page 2 of 2

CASE	DESCRIPTION	PROPOSED BY	MEMBER	SUBMITTAL DATE Last Revision	VOTE DATE	VOTE
08-06	Revision to Section 618.3 Construction Methods, add Leakage Test Procedures for HDPE Storm Drain Pipe.	Phoenix	Jeff Van Skike	2/06/2008 2/06/2008		0 Yes 0 No 0 Abstain
08-07	Revisions to Section 109.4 Compensation for Alteration of Work	Mesa	Gordon Haws	2/06/2008 2/06/2008		0 Yes 0 No 0 Abstain
08-08	Revisions to Section 301.3 Relative Compaction and Section 601.4 Foundation, Bedding, Backfilling and Compaction concerning optimum moisture and percent compaction.	Mesa	Gordon Haws	2/06/2008 2/06/2008		0 Yes 0 No 0 Abstain
08-09	Revisions to Section 625.3.1 Manholes	Mesa	Gordon Haws	2/06/2008 2/06/2008		0 Yes 0 No 0 Abstain
08-10	Detail 200 and Sections 336 and 601 – Trench backfill and pavement Replacement	SRP	Peter Kandarlis	2/06/2008 2/06/2008		0 Yes 0 No 0 Abstain
08-11						0 Yes 0 No 0 Abstain
08-12						0 Yes 0 No 0 Abstain

* Case was approved with verbal modifications at time of voting.

SECTION 321
Revision 11/9/07

2-5-08

ASPHALT CONCRETE PAVEMENT

321.1 DESCRIPTION:

This section is to provide specifications for furnishing all materials, mixing at a plant, hauling and placing a mixture of aggregate materials, mineral admixture and asphalt binder to form a pavement course for the following situations or projects: (move to other section)

- A capital improvement project where the work is being performed under a contract directly between the contractor and the Owner.
- A project being constructed under a permit, where the Owner's control and responsibility for maintenance will eventually be transferred upon dedication of the project or roadway to a city, county, or other entity.
- A project where the Owner is a private individual, company, or group and no city, county or other agency specifications apply to the project.

321.2 MATERIALS AND MANUFACTURE:

The materials shall conform with Section 710 for the type specified. The specific required mix type shall be called out in the contract documents or as directed by the engineer.

321.3 WEATHER AND MOISTURE CONDITIONS:

Asphalt concrete shall be placed only when the surface is dry, and when the atmospheric temperature in the shade is 40 degrees F. or above. No asphalt concrete shall be placed when the weather is foggy or rainy, or when the base on which the material is to be placed contains excessive moisture and is unstable. Excessive moisture is defined as the base or subgrade moisture is in excess of 2 percent above optimum moisture, determined in accordance with AASHTO T 99 corrected for the appropriate rock percentage. Asphalt concrete shall be placed only when the Engineer determines that weather conditions are suitable.

Deleted: Owner's Engineer

321.4 APPLICATION OF TACK COAT:

A tack coat shall be applied to all existing and to each new course of asphalt concrete prior to the placing of a succeeding lift of asphalt concrete. The tack coat may be deleted when a succeeding layer of asphalt concrete is being applied over a freshly laid course that has been subjected to very little traffic when approved by the Engineer.

Deleted: Owner's Engineer

The application of the tack coat shall comply with Section 329. The grade of emulsified asphalt shall be SS-1 h or CSS-1h as specified in Section 713.

The same material that is specified above for the tack coat shall be applied to the vertical surfaces of existing pavements, curbs, and gutters, against which asphalt concrete is to be placed.

The surface to be covered may require repair or patching as directed by the Engineer. This shall be addressed in the project specifications prior to the bidding of the project.

Deleted: Owner's Engineer

321.5 MIX DESIGN

The mix design shall be submitted to the Engineer at least five working days prior to the start of asphalt concrete production. Mix designs provided by the Reference from MAG Section 100 agency may be utilized on projects at the Engineer's discretion. The Engineer will review and approve the mix design to assure it contains all of the required information as outlined in Section 710.3.1. The target values for gradations, binder contents, and air voids will be established as the accepted Job Mix Formula (JMF) based upon the mix design. Mix designs not containing all of the information will be returned within five working days of receipt of all mix design information, for action and resubmission by the contractor.

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SECTION 321
Revision 11/9/07

Once the mix design has been approved by the agency and the mixing plant selected, the Contractor and/or his supplier shall not change plants nor utilize additional mixing plants without prior approval of the Engineer.

If the contractor elects to change its source of material, the contractor shall furnish the Engineer with a new mix design, which meets the requirements of Section 710, as amended by the Project Specifications.

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The contractor may make self-directed target changes to the approved mix design within the limits shown below. Requests for self-directed target changes shall be made in writing and acknowledged by the Engineer prior to the start of production of a lot and will remain in effect until such time as any additional changes are implemented.

Deleted: Owner's Engineer

The self-directed target changes must meet the contract requirements for mix design criteria and gradation limits.

TABLE 321-1	
MEASURED CHARACTERISTICS	ALLOWABLE SELF-DIRECTED TARGET CHANGES
Gradation (Sieve Size)	
3/8 inch	+ 2% from mix design target value
No 8	+ 2% from mix design target value
No 30	+ 1% from mix design target value
No 200	None
Binder Content	+ 0.2% from mix design target value
Effective Air Voids	None

The contractor may propose target changes, other than self-directed changes, to the approved mix design for the approval of the Engineer. The Engineer will determine if the proposed target change will result in mix production that meets the contract requirements for mix design criteria and gradation limits. The target changes will not be retroactive for the purpose of acceptance.

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Deleted: Owner's Engineer

321.6 MIX PRODUCTION:

All materials shall be proportioned by weight in a hot mix asphalt plant in the proportions required by the mix design to provide a homogeneous and workable mass. Each hot mix asphalt plant shall be inspected in accordance with the provisions contained in the 'Hot Mix Asphalt Production Facilities' by the Arizona Rock Products Association and shall have a current inspection certificate. Mixing plants shall conform to the requirements of AASHTO M 156, except as modified herein. Presentation to explain ARPA certification 710.5 to 710.7 Revision date for ARPA Cert.

In drum mix plants the mineral admixture shall be added and thoroughly mixed with the mineral aggregate by means of a mechanical mixing device prior to the mineral aggregate and mineral admixture entering the dryer. The moisture content of the combined mineral aggregate shall be a minimum of three percent by weight of the aggregate during the mixing process.

For drum-mix plants, the mineral admixture shall be weighed across a weigh belt, or other approved alternative weighing system, with a weight totalizer prior to entry into the mechanical mixing device. The mechanical mixing device shall be a pugmill type mixer that is in good working condition. The rate of the aggregate feed shall not exceed the mixing device's capacity in ton per hour. The mixer shall be constructed to minimize the loss of mineral admixture and shall be located in the aggregate delivery system at a location where the mixed material can be readily inspected. The mixing device shall be capable of effective mixing in the full range of the asphalt concrete production rates.

The hot plant and equipment shall be constructed and operated to prevent loss of mineral admixture through the dust collection system of the plant.

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A positive signal system shall be provided and utilized during production whereby the mixing shall automatically be stopped if the mineral admixture is not introduced into the mineral aggregate. The plant will not be permitted to operate unless the signal system is in good working condition.

SECTION 321
Revision 11/9/07

The introduction of bituminous material shall be controlled by an automated system fully integrated with the controls or the mineral aggregate and mineral admixture. The production of the plant shall be controlled by the rate required to obtain a uniform mixture of all components. Drying and heating shall be accomplished in such a manner as to preclude the mineral admixture from becoming coated with un-spent fuel. The completed asphalt concrete may be held in storage for up to 12 hours in insulated or heated silos, providing the minimum temperature noted herein for placement and compaction is met behind the placement device. If the Engineer determines that there is an excessive amount of heat loss, segregation and/or oxidation of the mixture due to temporary storage, use of surge bins or storage bins will be discontinued

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The temperature of the asphalt concrete, with unmodified binders, upon discharge from the mixer shall not exceed 335 degrees F. The discharge temperature may be increased on the recommendation of the binder supplier, when approved by the Engineer. If the asphalt concrete is discharged from the mixer into a hopper, the hopper shall be constructed so that segregation of the asphalt concrete will be minimized.

Deleted: Owner's Engineer

321.7 TRANSPORTATION:

Section 710.6 is included in the ARPA certification. The use of petroleum distillates or other substances that will have a detrimental effect on the asphalt concrete shall not be used as a release agent.

The beds of all transportation units shall be clean and smooth to allow the free flow of material into the paving machine's hopper.

Tarpaulins shall be furnished and used when the ambient temperature is below 65 degrees F.

321.8 PLACEMENT:

321.8.1 Placing

All courses of asphalt concrete shall be placed and finished by means of a self-propelled paving machine equipped with an automatically actuated control system, except under certain conditions or at locations where the Engineer deems the use of a self-propelled paving machine impracticable.

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The control system shall control the elevation of the screed at each end by controlling the elevation of one end directly and the other end indirectly either through controlling the transverse slope or alternatively when directed, by controlling the elevation of each end independently.

The control system shall be capable of working with one of the following devices:

- (A) Ski or non-contact device of not less than 30 feet in length, supported throughout its entire length
- (B) Taut stringline or wire set to grade
- (C) Short ski or sonar sensing units from curb control
- (D) Joint matching shoe

Failure of the control system to function properly shall be cause for the suspension of asphalt concrete production. In order to achieve a continuous operation, the speed of the paving machine shall be coordinated with the hot mix plant and transport units.

If the asphalt concrete is dumped from the hauling vehicles directly into the paving machine, care shall be taken to avoid jarring the machine or moving it out of alignment. No vertical load shall be exerted on the paving machine by the truck.

If asphalt concrete is dumped upon the surface being paved and subsequently loaded in the paving machine, the loading equipment shall be self-supporting and shall not exert any vertical load on the paving machine. Substantially all of the asphalt concrete shall be picked up and loaded into the paving machine.

SECTION 321
Revision 11/9/07

Self-propelled paving machines shall spread the mixture without segregation or tearing, true to line, grade and crown indicated on the Project plans. Pavers shall be equipped with hoppers and augers that will distribute the mixture uniformly in front of an adjustable floating screed. Care should be utilized when operating the paving machine. The raising of the hopper wings should be minimized and the paving machine should not be operated when in an empty or near-empty condition.

Screeds shall include any strike-off device operated by tamping or vibrating action which is effective, without tearing, shoving or gouging the mixture and which produces a course with a uniform texture and density for the full width being paved. Screeds shall be adjustable as to height and crown and shall be equipped with a controlled heating device for use when required.

At any place not accessible to the roller, the mixture shall be thoroughly compacted with tampers, to provide a uniform and smooth layer over the entire area compacted in this manner.

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321.8.2 Joints:

Transverse joints, before a surface course is placed in contact with a cold transverse construction joint, the cold existing asphalt concrete shall be trimmed to a vertical face for its full depth and exposing a fresh face. After placement and finishing the new asphalt concrete, both sides of the joint shall be dense and the joint shall be smooth and tight. The surface in the area of the joint shall not deviate more than ¼ inch from a 12-foot straightedge, when tested with the straightedge placed across the joint, parallel to the centerline. 25' straight edge is not practiced

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Longitudinal Joints of each course shall be staggered a minimum of 6 inches with relation to the longitudinal joint of the immediate underlying course cold transverse construction joint, the cold existing asphalt concrete shall be trimmed to a vertical face for its full depth and exposing a fresh face. After placement and finishing the new asphalt concrete, both sides of the joint shall be dense and the joint shall be smooth and tight. The surface in the area of the joint shall not deviate more than ¼ inch from a 12-foot straightedge, when tested with the straightedge placed across the joint, parallel to the centerline. The joint will be tack coated if required by the engineer.

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321.8.3 Leveling Course

A leveling course shall be used when specified, or as directed in writing by the Engineer, to bring existing pavement to a uniform grade prior to placing an overlay or other course. The compaction requirements contained in Section 321.10 do not apply to leveling courses.

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321.8.4 Compaction Base and Surface

It is the contractor's responsibility to perform any desired Quality Control monitoring and/or testing during compaction operations to achieve the required compaction. Asphalt concrete immediately behind the laydown machine shall be a minimum of 250 degrees F as measured from a probe type thermocouple thermometer that has been calibrated to an AASHTO standard. The probe type thermocouple thermometer shall have a current calibration sticker attached. When measuring the temperature of the mat, the probe shall be inserted at mid-depth and as horizontal as possible to the mat.

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Asphalt compaction equipment shall be of sufficient size and weight to accomplish the required compaction. All compaction equipment shall be operated and maintained in accordance with the manufacturer's recommendations and the project requirements. Covers operating speed

Pneumatic tired compactors shall be equipped with skirt-type devices mounted around the tires so that the temperature of the tires will be maintained during the compaction process.

The Engineer will determine the acceptability of the pavement compaction in accordance with Section 321.10 – "Acceptance".

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321.8.5 Smoothness:

SECTION 321
Revision 11/9/07

The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than one-fourth (¼) inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel to the centerline of the roadway.

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321.9 QUALITY CONTROL:

It is the contractor's responsibility to perform any desired Quality Control monitoring and/or testing during asphalt concrete production to achieve the required compaction and to perform any desired Quality Control monitoring and/or testing during asphalt concrete production to achieve the required mix properties. The Engineer May obtain samples of any portion of any material at any point of the operations for his own use. Also, the Engineer may order the use of any drying, proportioning and mixing equipment or the handling of any material discontinued which, in his/her opinion, fails to produce a satisfactory mixture.

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The asphalt concrete produced shall conform to the properties of the mix design. When the asphalt concrete does not conform to the approved mix design properties, the production shall cease immediately.

321.10 ACCEPTANCE:

321.10.1 Acceptance Criteria:

Unless otherwise specified, asphalt concrete will be divided into lots for the purpose of acceptance. A lot shall be considered to be one day's production. When the quantity of asphalt concrete placed in a day exceeds 500 tons but is less than 2000 tons, the lot shall be divided into 500 ton sublots or fraction thereof. Where the quantity of asphalt concrete placed in a day exceeds 2000 tons, the day's production will be divided into four (4) approximately equal sublots. A minimum of one sample will be obtained from each lot. Test used to determine acceptance will be performed by the Engineer or a laboratory employed by the Engineer. In either case the laboratory shall be accredited by the AASHTO Accreditation Program (AAP), for the tests being performed. The acceptance laboratory will take representative samples of the asphalt concrete from each subplot to allow for gradation, binder content, air voids, pavement thickness and compaction of base and surface course. Each subplot will be accepted based upon the test data from the sample(s) from that subplot. All acceptance samples shall be taken using random locations or times designated by the Engineer in accordance with ASTM D 3665.

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321.10.2 Gradation, Binder Content and Air Voids:

The acceptance laboratory will take a sample of the asphalt concrete in accordance with the requirements of Section 2 or 4 of Arizona Test Methods 104 or AASHTO T168 from each subplot. The minimum weight of the sample shall be 45 pounds. Asphalt binder content and gradation shall be determined in accordance with AASHTO T308 using the ignition furnace for each subplot. The acceptance laboratory is responsible for obtaining the necessary materials and performing an ignition furnace calibration as outlined in AASHTO T308 for each asphalt concrete mixture utilized on the project. The correction factor used for each test shall be clearly indicated on the report. The bulk density for Marshall mix designs shall be tested in accordance with AASHTO T245. The bulk density for Gyratory mix designs shall be tested in accordance with AASHTO T312. The maximum theoretical density shall be tested in accordance with the requirements of AASHTO T209. Effective voids determined on the laboratory compacted specimens will be determined at a minimum of once per lot in accordance with the requirements of AASHTO T269. Should the testing for effective air voids not meet the "Full Payment" or "No Corrective Action" requirements of table 321-5, additional testing for laboratory air voids on the remaining sublots will be performed as necessary to determine the extent of the deficiency. Acceptance testing results will be furnished to the contractor within five working days of receipt of samples by the acceptance laboratory.

The allowable deviations for acceptable production of each measured characteristic from the values established in the JMF for each subplot are as follows:

TABLE 321-3	
ACCEPTANCE LIMITS FOR ASPHALT CONCRETE	
Maximum Aggregate Size	100% passing
Nominal Maximum Aggregate Size	±7%

SECTION 321
Revision 11/9/07

No. 8 Sieve to the Nominal Maximum Aggregate Size	±6%
No. 100 and No. 30 Sieves	±4%
No. 200 Sieve	±2%

If the results from a single acceptance sample fall outside of the acceptance limits in Table 321-3 a second sample shall be taken and if the second acceptance sample is also outside of the acceptance limits in Table 321-3 production of asphalt concrete shall cease. Production shall not begin again until calibration test results verify that adjustments made to materials or proportions yield a gradation that falls within acceptance limits in table 321-3.

Deleted: the results of an asphalt concrete mix sample fall within the acceptance limits in Table 321-3.

(AGENCIES TO REVIEW THESE TABLES)

TABLE 321-4		
ASPHALT BINDER CONTENT CORRECTIVE ACTION FOR DEVIATIONS		
Deviation from that permitted	When the contracting agency is the owner: Payment Reduction (\$ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
0.0 to 0.1% points	\$2.00/ton	EA (see 321.10.6)
Over 0.1 to 0.2% points	\$6.00/ton	EA (see 321.10.6)
Over 0.2% points	EA (see 321.10.6) or Removal	EA (see 321.10.6) or Removal

TABLE 321-5		
LABORATORY VOIDS ACCEPTANCE AND PENALTIES		
Laboratory Air Voids (Measured at N _{des} or 75 blows as applicable)	When the contracting agency is the owner: Payment Reduction (\$ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
Less than 1.5%	EA (see 321.10.6) or Removal	EA (see 321.10.6) or Removal
1.5-2.0%	\$2.50	EA (see 321.10.6)
2.1-2.7%	\$1.00	EA (see 321.10.6)
2.8-6.2%	Full Payment	No corrective action
6.3-6.9%	\$1.00	EA (see 321.10.6)
7.0-8.0%	\$2.50	EA (see 321.10.6)
Greater than 8.0%	EA (see 321.10.6) or Removal	EA (see 321.10.6) or Removal

321.10.3 Surface Drainage:

If directed by the Engineer surface drainage test shall be performed in accordance with (?). The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than 1/4 inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel to the centerline of the roadway. The straightedge shall be furnished by the contractor and shall be acceptable to the Engineer.

All streets shall be water tested for drainage in the presence of the Engineer or designated representative before final acceptance. Any areas not draining properly shall be corrected to the Engineer's satisfaction at the Contractor's expense. Water for this testing shall be provided and paid for by the Contractor.

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Deleted: When deviations in excess of the above tolerance are found, humps or depressions shall be corrected to meet the specified tolerance, or shall be cut out along neat straight lines and replaced with fresh hot mixture and thoroughly compacted to conform with and bond to the surrounding area. Materials and work necessary to correct such deviations shall be at no additional cost to the Contracting Agency.

SECTION 321
Revision 11/9/07

When deviations in excess of the above tolerance are found, humps or depressions shall be corrected to meet the specified tolerance, or shall be cut out along neat straight lines and replaced with fresh hot mixture and thoroughly compacted to conform with and bond to the surrounding area. Materials and work necessary to correct such deviations shall be at no additional cost to the Contracting Agency.

321.10.4 Pavement Thickness:

Pavement thickness will be determined from cores secured from each subplot for this purpose. Such cores will be taken and measured by the Asphalt Concrete Coring Method. This method can be found at www.azrockproducts.org or www.azagc.org websites. Each core location will be patched by the party responsible for the testing.

If the pavement thickness is deficient from the target thickness by 0.25 inches or less, it will be paid for at the contract unit price. If the pavement thickness deficiency is greater than 0.25 inches and the contracting agency is not the owner (i.e. permits) the following steps will apply:

1. If the thickness deficiency of the pavement exceeds 0.25 inch, the limits of the deficient area will be isolated by coring at maximum intervals of 100 feet from the deficient core. The thicknesses of the original deficient core will be averaged with the thicknesses of the cores taken from 100 feet on each side of it to determine compliance with the acceptance requirements.
2. If the pavement thickness from step one above deviates from the target thickness by more than 0.25 inch but not more than 0.50 inch, corrective action will be required. This corrective action will consist of application of a Type II slurry seal coat in accordance to Section 715. The Contractor may present an engineering analysis outlining other proposed remedial measures for the consideration of the Engineer. The Engineer will review the engineering analysis and decide within 30 working days whether to accept the proposed remedial measures.
3. If the pavement thickness from step one above deviates from the target thickness by more than 0.50 inch, corrective action will be required. The deficient area will be overlaid for the full width of the pavement to meet or exceed the designed thickness, with the appropriate end and edge milling, with a mixture approved by the Engineer. The Contractor may present an engineering analysis outlining other proposed remedial measures for the Engineer's consideration. The Engineer will review the engineering analysis and decide within 30 working days whether to accept the proposed remedial measures. If the Engineer chooses to reject the engineering analysis, the indicated overlay will be constructed by the Contractor at no additional cost to the Owner.

If the pavement thickness deficiency is greater than 0.25 inches and the contracting agency is the owner, Table 321-2 will apply.

Deleted: If directed by the Engineer surface drainage shall be performed in accordance with (). The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than 1/4 inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel to the centerline of the roadway. The straightedge shall be furnished by the contractor and shall be acceptable to the Engineer.¶

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TABLE 321-6

PAVEMENT THICKNESS PAYMENT REDUCTION (AC)
For Thickness Deficiency of More Than 0.25 inches and less than 0.50 inches

Specified Mat Thickness	Reduction in Payment or Corrective Action
Less than 1.5 inches	50%
1.50 inches to 1.99 inches	33%

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SECTION 321
Revision 11/9/07

2.00 inches to 2.49 inches	25%
2.50 inches to 2.99 inches	20%
3.00 inches and over	17%

321.10.5 Density:

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Achieving the required compaction is the responsibility of the contractor. The number and types of rollers is the contractor's responsibility and shall be sufficient to meet these requirements.

In-place air voids shall be determined in accordance with AASHTO T269 utilizing cores taken from the finished pavement. The maximum theoretical density used in the determination of in-place air voids will be the average value from the acceptance samples determined for the Lot as outlined in 321.10.1.

The Engineer will designate two random test locations for each subplot and the acceptance laboratory will obtain two cores from each location. The two cores will be averaged for acceptance. The outside one foot of each pass of the pavement course or any unconfined edge will be excluded from testing. The Engineer may exclude areas from the compaction lot that are not accessible by normal compaction equipment.

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The Contractor will provide the traffic control to facilitate any coring operations necessary for compaction acceptance.

Cores will be taken per the Asphalt Concrete Coring Method. This method can be found at www.azrockproducts.org or www.azagc.org websites. The acceptance laboratory will furnish test results within 3 working days of receipt of the cores.

If the pavement density has in-place voids of 8.0% or less, the asphalt concrete will be paid for at the contract unit price. If the pavement density has in-place voids greater than 8.0%, the limits of the deficient area will be isolated within the subplot by coring at maximum intervals of 100 feet from the deficient core. The in-place voids of the original deficient core will be averaged with the in-place voids of the cores taken from 100 feet on each side of it to determine compliance with the acceptance requirements. If the average of the in-place voids is greater than 8.0% then Table 321-6 shall apply to the subplot.

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TABLE 321-7		
PAVEMENT DENSITY PENALTIES		
Limits of In-place Voids	When the contracting agency is the owner: Payment Reduction (\$ per ton of asphalt concrete)	When the contracting agency is not the owner (i.e. permits): Corrective Action
8.1% to 9.0%	\$4.00/ton of Asphalt Concrete penalty	EA
9.1% to 10.0%	\$6.00/ton of Asphalt Concrete penalty	EA and Type II Surry Seal
10.1% to 11.0%	\$9.00/ton and an EA (see 321.10.6) or Removal*	EA (see 321.10.6) or Removal*
Greater than 11.0%	Removal	Removal

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*Note: The Contractor shall remove and replace the entire subplot that is deficient.

321.10.6 Engineering Analysis:

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Within ten working days after receiving notice that a subplot of asphalt concrete is deficient for removal by the Engineer, the contractor may submit a written proposal to accept the material in place at the applicable penalties.

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SECTION 321
Revision 11/9/07

The proposal shall contain an engineering analysis of the anticipated performance of the asphalt concrete if left in place. The engineering analysis shall also detail any proposed corrective action on the performance. The engineering analysis shall be performed by a professional engineer experienced in asphalt concrete testing and mix designs. If the sublot is submitted for referee testing by the contractor, the ten working days allowed to prepare an engineering analysis will begin upon notification of referee test results.

Within ~~three~~ working days, the ~~Engineer~~ will determine whether or not to accept the contractor's proposal.

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321.11 REFEREE:

In the event ~~the contractor~~ elects to question the acceptance test results for a sublot, the Contractor may make a written request for additional testing of that sublot. ~~The Contractor will engage an independent laboratory who is accredited by AAP, in all of the acceptance tests. The independent laboratory shall be acceptable to the Engineer, and shall perform a complete, new set of acceptance tests (as required by Section 321.10 representing the area or set of tests in question).~~

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These tests shall include asphalt binder content, aggregate gradation, Marshall or Gyratory unit weight, and maximum theoretical unit weight. Samples for referee testing shall come from representative samples obtained from the completed pavement.

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The number of samples taken will be the same as specified in Section 321.10. The independent laboratory shall compile the test results and transmit them to both the ~~Engineer~~ and the Contractor. The independent laboratory shall include a letter signed by an Engineer registered in the State of Arizona, who is experienced in asphalt concrete testing and mix designs. The signed letter shall give an opinion that the material evaluated either does or does not comply with project specifications, and shall clearly describe any deficiencies, and the results will be binding between all parties.

321.12 MEASUREMENT:

Asphalt concrete pavement will be measured by the ton, or by the square yard, for the mixture actually used as allowed above, which shall include the required quantities of mineral aggregates, ~~asphalt binder, and mineral admixture.~~ Measurement shall include any tonnage used to construct intersections, roadways, streets, or other miscellaneous surfaces indicated on the plans or as directed by the ~~Engineer.~~

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321.13 PAYMENT:

The asphalt concrete measured as provided above, will be paid for at the contract price per ton or square yard, as adjusted per Section 321.10 ACCEPTANCE, which price shall be full compensation for the item complete, as herein described and specified.

Deleted: The bid price per ton or square yard for asphalt concrete shall include the cost of the asphalt cement in the percentages as specified in Section 710.

Payment for tack coat will be by the ton diluted, based on the rate of application, ~~as directed by the Engineer.~~

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No payment will be made for any overrun in quantity of asphalt concrete in excess of 10 percent based on actual field measurement of area covered, design thickness, and the mix design unit weight. The calculations and payment for overrun will be by individual bid item. To compensate or adjust for a thickness deficiency in an underlying asphalt concrete course, the ~~Engineer may authorize a quantity increase in excess of 10 percent for a subsequent asphalt concrete course. In such cases, the quantity in excess of 10 percent will be paid for at the lowest unit bid price.~~

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Except as otherwise specified in the special provisions, no separate payment will be made for work necessary to construct miscellaneous items or surfaces of asphalt concrete.

SECTION 710
Revision 2/05/2008

ASPHALT CONCRETE

710.1 GENERAL:

Asphalt concrete shall be a mixture of asphalt cement and mineral aggregates. Mineral admixture shall be included in the mixture when required by the mix design or by the Engineer. Asphalt concrete shall be produced in accordance with Section 321.

The designation for asphalt concrete mixes shall be based on the nominal maximum aggregate size of the mix. The applicable mix designations are 3/8 inch, 1/2 inch, 3/4 inch and Base mix.

Each mix shall be designed using Marshall or Gyratory compaction methods. Marshall mixes may be used for low or high traffic conditions, while Gyratory mixes are recommended for only high traffic conditions. Low traffic conditions are conditions where the asphalt mix will be subject to low volume and low weight vehicle usage. Examples of this condition are residential streets, most parking lots and residential minor collector streets. High traffic conditions are conditions where the asphalt mix will be subject to high volume and/or heavy weight vehicle usage as found on major collector, arterial and commercial streets. Street classifications (i.e. minor collector and major collector shall be determined by the specifying agency).

The following table (Table 710-1) displays the recommended lift thickness for various asphalt concrete mix designations found within Section 710. Please note that these recommended lift thicknesses are minimums based on each mix designation's "Nominal Aggregate Size" and the relative coarseness of its gradation. The compacted thickness of layers placed shall not exceed 150% of the Design Target Lift Thickness of Table 710-1 except as otherwise provided in the plans and specifications, or if approved in writing by the Engineer. (From 321.5.4 of existing MAG)

TABLE 710-1		
RECOMMENDED MINIMUM LIFT THICKNESS'S for ASPHALT CONCRETE MIXES		
Designation (inches)	Target Lift Thickness Marshall Mixes	Target Lift Thickness Gyratory Mixes
3/8"	1.0 inches	1.5 inches
1/2"	1.5 inches	2.0 inches
3/4"	2.5 inches	3.0 inches
Base	3.0 inches	n/a

710.2 MATERIAL:

710.2.1 Asphalt Binder: The asphalt binder specified in this section has been developed for use in desert climate conditions. Should it be utilized in other climates, consideration should be given to adjustments in the asphalt binder selection. The asphalt binder shall be Performance Grade Asphalt conforming to the requirements of Section 711 for PG 70-10, unless otherwise approved by the Engineer or specified differently in the plans or special provisions.

710.2.2 Aggregate: Coarse and Fine aggregates shall conform to the applicable requirements of this section. Coarse mineral aggregate shall consist of crushed gravel, crushed rock, or other approved inert material with similar characteristics, or a combination thereof, conforming to the requirements of these specifications.

Coarse aggregate for hot mix asphalt is material retained on or above the No. 4 sieve and Fine aggregate is material passing the No. 4 sieve. Aggregates shall be relatively free of deleterious materials, clay balls, and adhering films or other material that prevent coating with the asphalt binder. Coarse and Fine aggregates shall conform to the following requirements when tested in accordance with the applicable test methods.

SECTION 710
Revision 2/05/2008

TABLE 710-2
COARSE/FINE AGGREGATE REQUIREMENTS

Characteristics	Test Method	Low Traffic	High Traffic
Fractured Faces, % (Coarse Aggregate Only)	Arizona 212	75, 1 or more	85, 1 or more 80, 2 or more
Uncompacted Voids, % Min.	AASHTO T-304, Method A	42	45
Flat & Elongated Pieces, % 5:1 Ratio	ASTM D-4791	10.0 Max.	10.0 Max.
Sand Equivalent, %	AASHTO T-176	50 Min.	50 Min.
Plasticity Index	AASHTO T-90	Non-plastic	Non-plastic
L.A. Abrasion, %Loss	AASHTO T-96	9 max. @ 100 Rev. 40 max. @ 500 Rev.	9 max. @ 100 Rev. 40 max. @ 500 Rev.
Combined Bulk Specific Gravity	AI MS-2/SP-2	2.35 – 2.85	2.35 – 2.85
Combined Water Absorption	AI MS-2/SP-2	0 – 2.5%	0 – 2.5%

Tests on aggregates used in asphalt concrete outlined above, shall be performed on materials furnished for mix design purposes and composited to the mix design gradation.

Blend sand (naturally occurring or crushed fines) shall be clean, hard and sound material which will readily accept asphalt binder coating. The blend sand grading shall be such that, when it is mixed with the other mineral aggregates, the combined product shall meet the requirements of Table 710-2.

710.2.3 Mineral Admixture: Mineral admixture when used as a anti-stripping agent in asphalt concrete shall conform to the requirements of AASHTO M-17. Mineral admixture used in asphalt concrete shall be dry hydrated lime, conforming to the requirements of ASTM C-1097 or Portland cement conforming to ASTM C 150 Type II or ASTM C 595 Type IP. The amount of hydrated lime or Portland cement used shall be determined by the mix design. The minimum Mineral admixture content within a mix will be 0.75 percent, by weight of total aggregate.

710.3 MIX DESIGN REQUIREMENTS:

710.3.1 General: The mix design for asphalt concrete shall be prepared by a laboratory that is accredited through the AASHTO Accreditation Program (AAP) in Hot Mix Asphalt Aggregates and Hot Mix Asphalt. The laboratory shall be under the direct supervision of a Civil Engineer, registered by the State of Arizona, and who is listed by ADOT as a “Qualified Asphaltic Concrete Mix Design Engineer” within ADOT’s current list of approved laboratories. The current list of approved laboratories is available on ADOT’s web page www.azdot.gov. The date of the design shall not be older than two years from the date of submittal, unless supportive documentation is provided and approved by the Engineer.

The mix design report shall include the following elements as a minimum.

- (1) The name and address of the testing organization and the person responsible for the mix design report.
- (2) The mix plant identification and/or location, as well as the supplier or producer name.
- (3) A description of all products that are incorporated in the asphalt concrete along with the sources of all products, including admixtures and asphalt binder, and their method of introduction.
- (4) The supplier and grade of asphalt binder, the source and type of mineral aggregate, and the percentage of asphalt binder and mineral admixture used.
- (5) The results of all testing, determinations, etc., such as: specific gravity and gradation of each component, water absorption, sand equivalent, loss on abrasion, fractured coarse aggregate particles, immersion compression results (Index of Retained Strength, wet and dry strengths), Marshall stability and flow, asphalt absorption, percent air voids, voids in mineral aggregate, and bulk density. Historical abrasion values may be supplied on existing sources. The submittal should include a plot of the gradation on the Federal Highway Administration’s 0.45 Power Gradation Chart, plots of the compaction curves and the results of moisture sensitivity testing.

SECTION 710
Revision 2/05/2008

(6) The laboratory mixing and compaction temperature ranges for the supplier and grade of asphalt binder used within the mix design.

(7) A specific recommendation for design asphalt binder content and any limiting conditions that may be associated with the use of the design, such as minimum percentages of crushed or washed fine aggregate.

(8) The supplier's product code, the laboratory Engineer's seal (signed and dated), and the date the design was performed.

The mix design shall be submitted to the Agency or Engineer by the Contractor/Supplier for which it was developed as part of his project submittals. Once the mix design has been approved by the agency or Engineer, the Contractor and/or his supplier shall not change plants nor utilize additional mixing plants without prior approval of the Engineer. Any changes in the plant operation, the producer's pit, the asphalt binder, including modifiers in the asphalt binder, or any other item that will cause an adjustment in the mix, shall be justification for a new mix design to be submitted.

710.3.2 Mix Design Criteria: The mix design shall be performed by one of two methods, Marshall Mix Design or Gyratory Mix Design. The method shall be specified on the plans, special provisions, or by the Engineer. A minimum of 4 points will be used to establish the mix design results. The oven aging period for both Marshall and Gyratory mix design samples shall be 2 hours.

710.3.2.1 Marshall Mix Design: The Marshall Mix Design shall be performed in accordance with the requirements of the current edition of the Asphalt Institute's Manual, MS-2 "Mix Design Methods for Asphalt Concrete." The mix shall utilize the compactive effort of 75 blows per side of specimen. The mix shall comply with the criteria in Table 710-3.

TABLE 710-3
MARSHALL MIX DESIGN CRITERIA

Criteria	Requirements				Designated Test Method
	3/8" Mix	1/2" Mix	3/4"	Base Mix	
1. Voids in Mineral Aggregate: %, min	15.0	14.0	13.0	12.0	AI MS-2
2. Effective Voids: %, Range	4.0 ± 0.2	4.0 ± 0.2	4.0 ± 0.2	4.0 ± 0.2	AI MS-2
3. Absorbed Asphalt: %, Range	0 - 1.0	0 - 1.0	0 - 1.0	0 - 1.0	AI MS-2
4. Dust to Eff. Asphalt Ratio, Range	0.6 - 1.4	0.6 - 1.4	0.6 - 1.4	0.6 - 1.4	*AI MS-2
5. Tensile Strength Ratio: %, Min.	60	60	60	60	AASHTO T-283
6. Dry Tensile Strength: psi, Min.	100	100	100	100	AASHTO T-283
7. Stability: pounds, Minimum	2,000	2,500	2,500	3000	AASHTO T-245
8. Flow: 0.01-inch, Range	8 - 16	8 - 16	8 - 16	8 - 16	AASHTO T-245
9. Mineral Aggregate Grading Limits	AASHTO T-27				
Sieve Size	Percent Passing with Admix				
	3/8 inch Mix	1/2 inch Mix	3/4 inch Mix	Base Mix	
1-1/4 inch				100	
1 inch			100	90-100	
3/4 inch		100	90 - 100	85-95	
1/2 inch	100	85 - 100	---	---	
3/8 inch	90-100	62 - 85	62 - 77	57-72	
No. 8	45-60	40 - 50	35 - 47	33-43	
No. 40	10-22	10 - 20	10 - 20	9-18	
No. 200	2.0 - 10.0	2.0 - 10.0	2.0 - 8.0	1.0 - 7.0	

* The ratio of the mix design composite gradation target for the No. 200 sieve, including admixture, to the effective asphalt content shall be within the range 0.6 to 1.4.

SECTION 710
Revision 2/05/2008

710.3.2.2 Gyratory Mix Design: Gyratory Mix Designs shall be performed in accordance with the requirements of current edition of the Asphalt Institute's SP-2 manual. Mix design laboratory compacted specimens shall be prepared using a gyratory compactor in accordance with AASHTO T-312.

The mix design shall be formulated in a manner described for volumetric mix designs in the current edition of the Asphalt Institute Manual SP-2, except the number of trial blend gradations necessary will be determined by the mix design laboratory. Duplicate gyratory samples shall be prepared at a minimum of four (4) binder contents to select the recommended binder content. The completed mix design shall meet all the mineral aggregate and mix design criteria specified herein.

For purposes of design, the number of gyrations shall be 8 for Nini, 100 for Ndes, and 160 for Nmax. The corrected density of the specimens shall be less than 89.0 percent of maximum theoretical density at 8 gyrations. The corrected density of the specimens shall be less than 98.0 percent of maximum theoretical density at 160 gyrations.

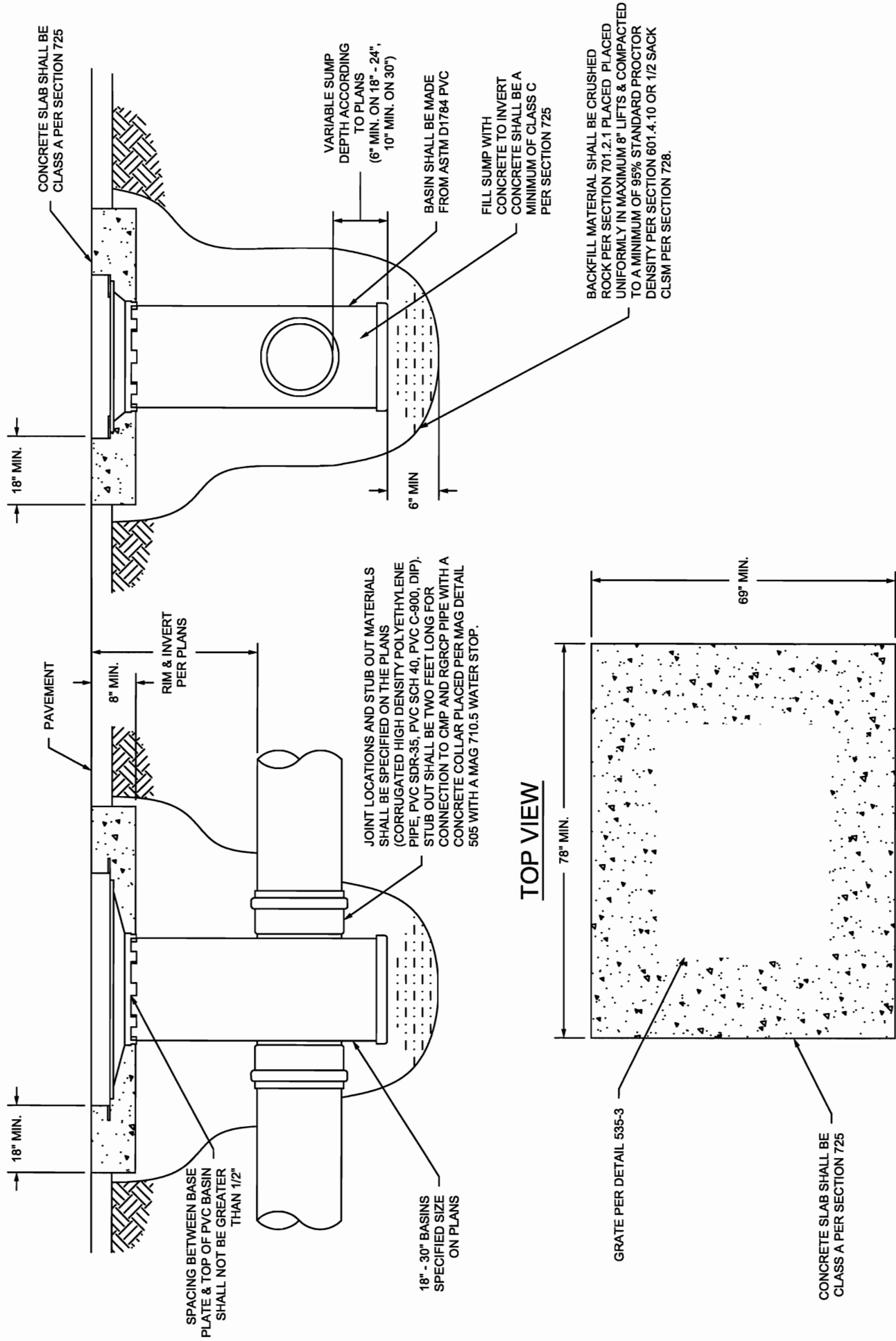
The mix shall comply with the criteria in Table 710-4.

TABLE 710-4
GYRATORY MIX DESIGN CRITERIA

Criteria	Requirements			Designated Test
	3/8" Mix	1/2" Mix	3/4" Mix	Method
1. Voids in Mineral Aggregate: %, Min.	15.0	14.0	13.0	AI SP-2
2. Effective Voids: %, Range	4.0 ± 0.2	4.0 ± 0.2	4.0 ± 0.2	AI SP-2
3. Absorbed Asphalt: %, Range	0 - 1.0	0 - 1.0	0 - 1.0	AI SP-2
4. Dust to Eff. Asphalt Ratio, Range	0.6 - 1.4	0.6 - 1.4	0.6 - 1.4	*AI SP-2
5. Tensile Strength Ratio: %, Min.	70	70	70	AASHTO T-283
6. Dry Tensile Strength: psi, Min.	75	75	75	AASHTO T-283
7. Mineral Aggregate Grading Limits				AASHTO T-27
	Percent Passing with Admix			
Sieve Size	3/8 inch Mix	1/2 inch Mix	3/4 inch Mix	
1 inch			100	
3/4 inch		100	90-100	
1/2 inch	100	90-100	43-89	
3/8 inch	90-100	53-89	-	
No. 8	32-47	29-40	24-36	
No. 40	2-24	3-20	3-18	
No. 200	2.0-8.0	2.0-7.5	2.0-6.5	

* The ratio of the mix design composite gradation target for the No. 200 sieve, including admixture, to the effective asphalt content shall be within the range 0.6 to 1.4.

710.3.2.3 Moisture Sensitivity Testing: Moisture sensitivity testing will be performed in accordance with AASHTO Test Method T-283 for both Marshall and Gyratory mix designs. The minimum required Tensile Strength Ratio is indicated in the tables above.



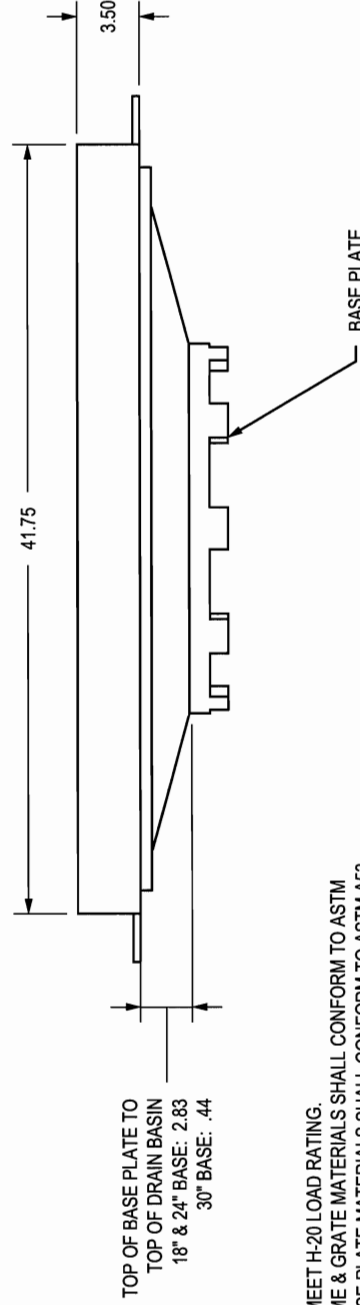
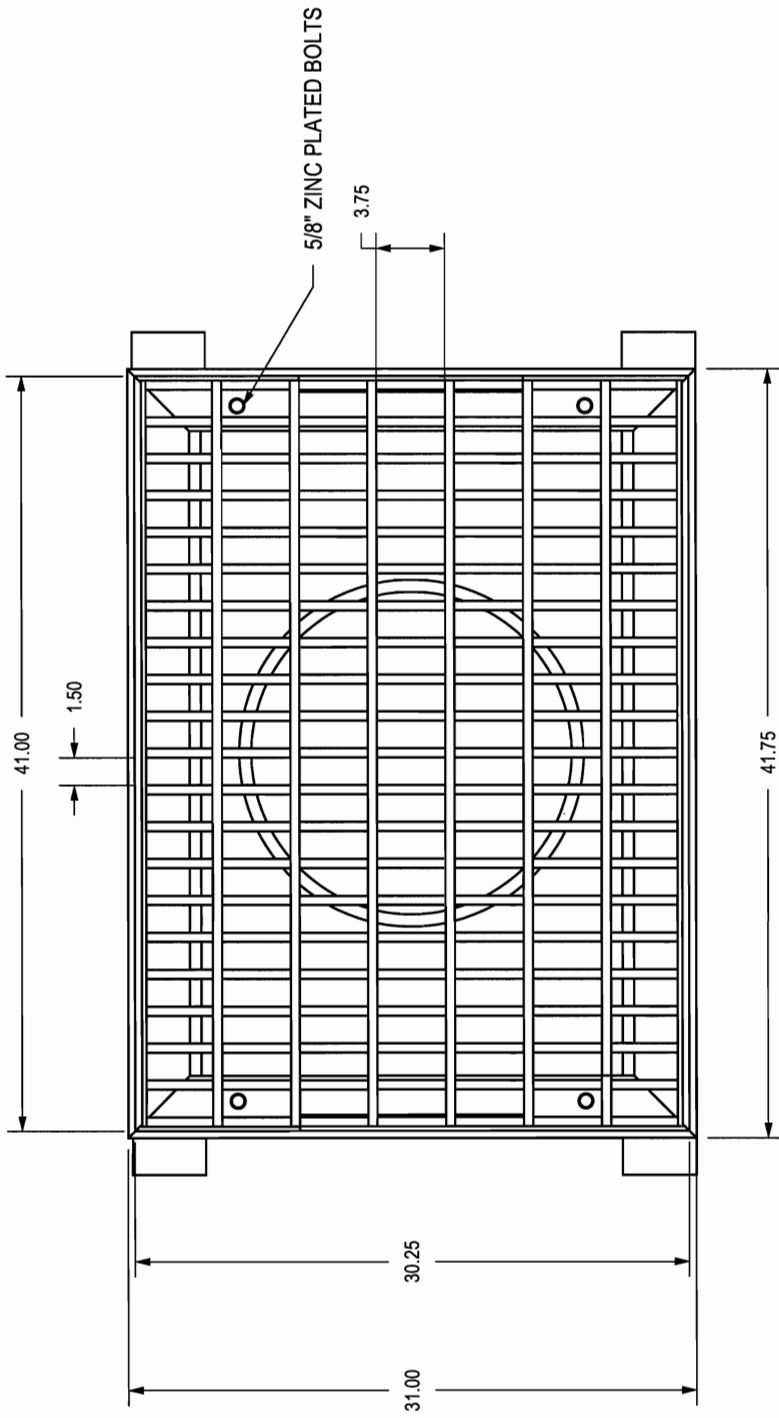
TOP VIEW

DETAIL NO.
535-2

CATCH BASIN 'J'

REVISED

DETAIL NO.
535-2



NOTES:

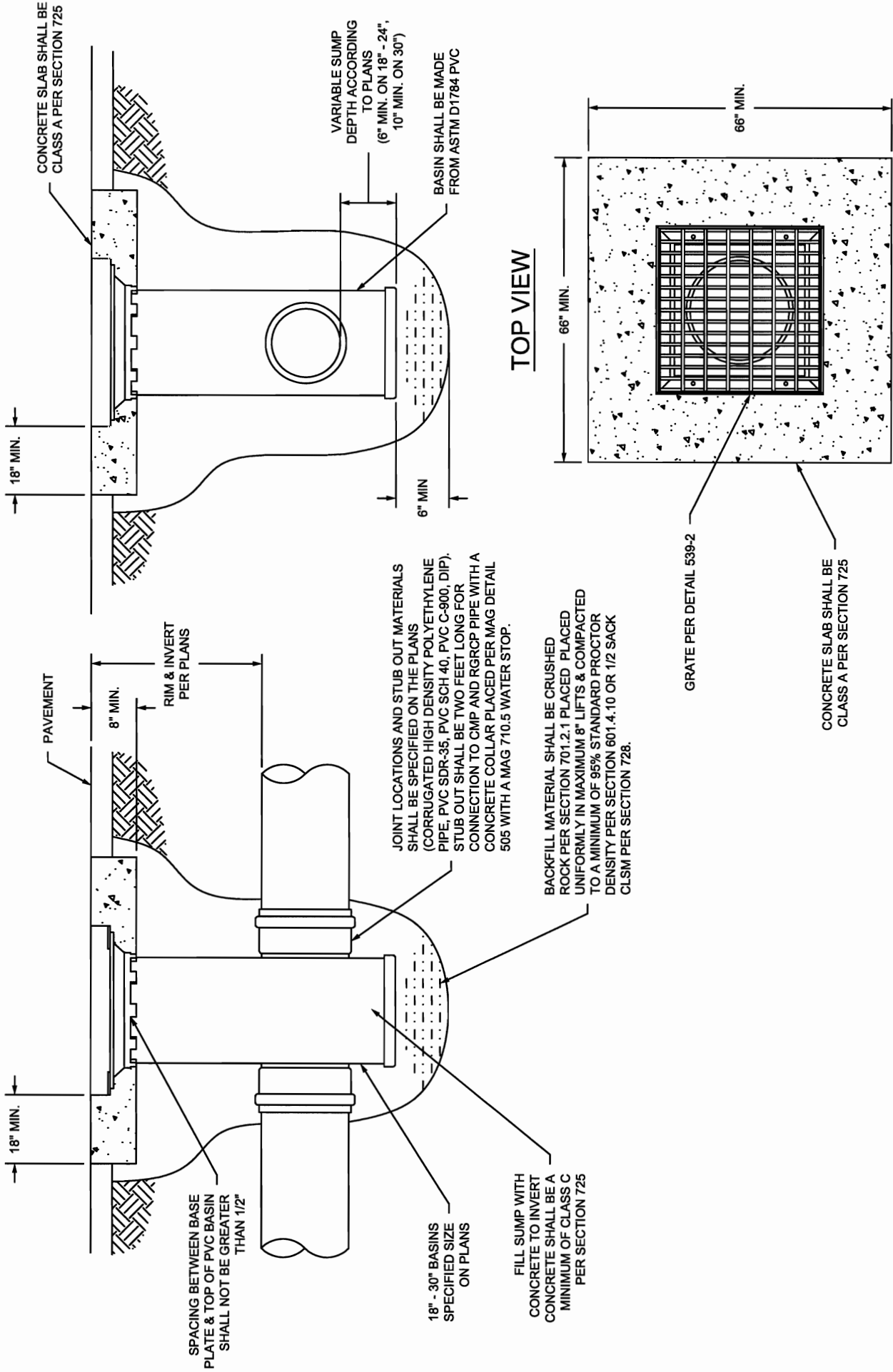
1. GRATE SHALL MEET H-20 LOAD RATING.
2. QUALITY: FRAME & GRATE MATERIALS SHALL CONFORM TO ASTM A-36 STEEL. BASE PLATE MATERIALS SHALL CONFORM TO ASTM A53 GRADE 70-50-05 DUCTILE IRON
3. ALL STRUCTURAL STEEL TO BE PAINTED ONE SHOP COAT OF NO. 1 PAINT AND TWO FIELD COATS OF NO. 10 PAINT AS PER SECT. 790.
4. ALL WELDS ON FRAME AND SIDE BARS ON GRATE SHALL BE FULL LENGTH OF JOINT.
5. APPROX. DRAIN AREA = 761.18 SQ IN.

DETAIL NO.
535-3

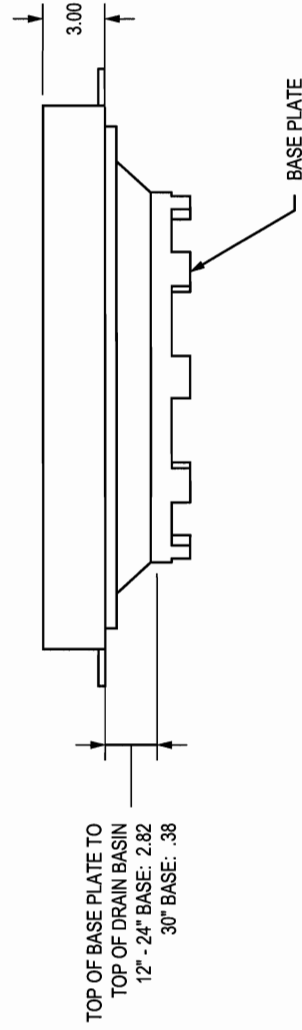
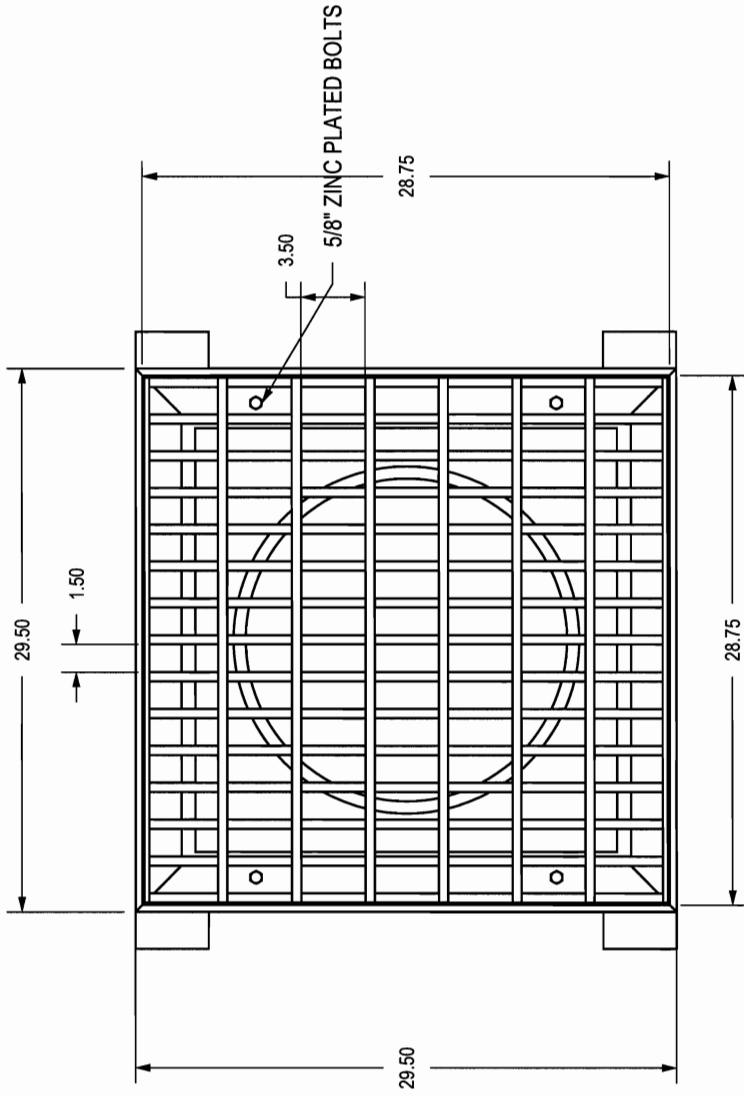
GRATE FOR CATCH BASIN 'J'

REVISED

DETAIL NO.
535-3



DETAIL NO. 537-2	CATCH BASIN - TYPE "I"	REVISED	DETAIL NO. 537-2
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NOTES:

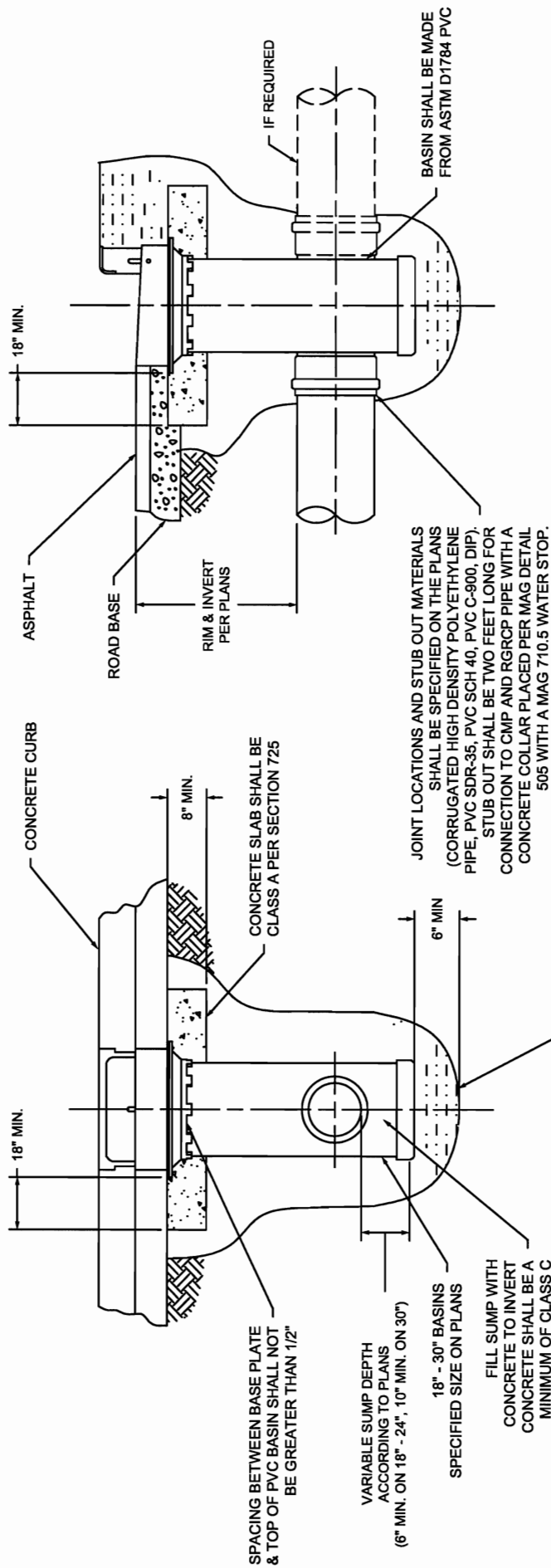
1. GRATE SHALL MEET H-20 LOAD RATING.
2. QUALITY: FRAME & GRATE MATERIALS SHALL CONFORM TO ASTM A-36 STEEL, BASE PLATE MATERIALS SHALL CONFORM TO ASTM A53 GRADE 70-50-05 DUCTILE IRON
3. ALL STRUCTURAL STEEL TO BE PAINTED ONE SHOP COAT OF NO. 1 PAINT AND TWO FIELD COATS OF NO. 10 PAINT AS PER SECT. 790.
4. ALL WELDS ON FRAME AND SIDE BARS ON GRATE SHALL BE FULL LENGTH OF JOINT.
5. APPROX. DRAIN AREA = 551.25 SQ IN.

DETAIL NO.
539-2

GRATE FOR CATCH BASIN 'I'

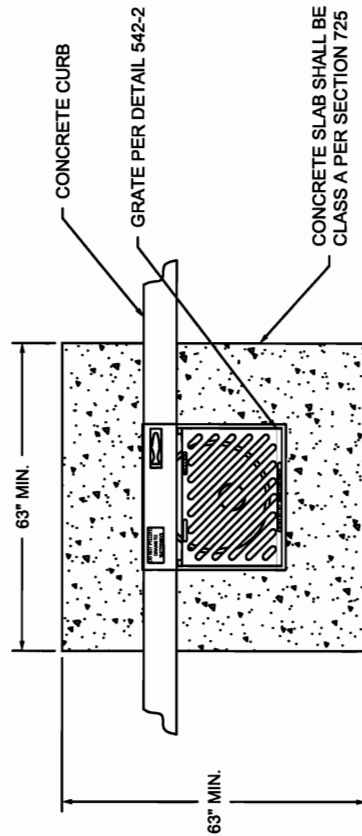
REVISED

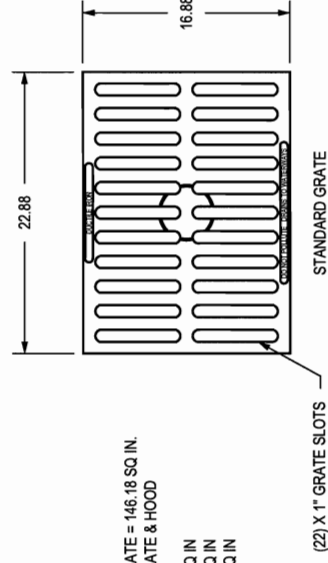
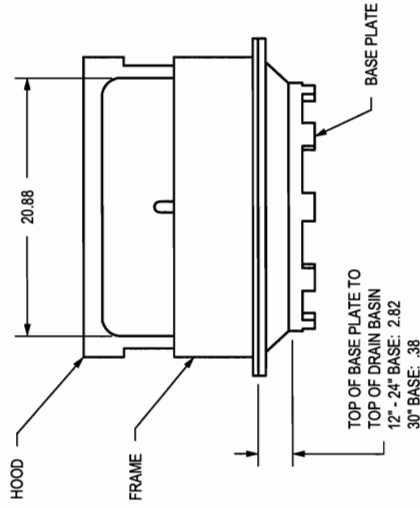
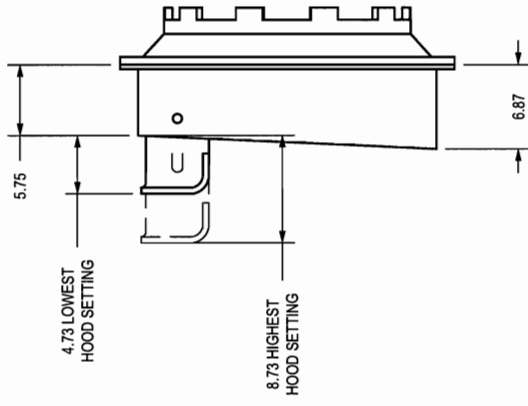
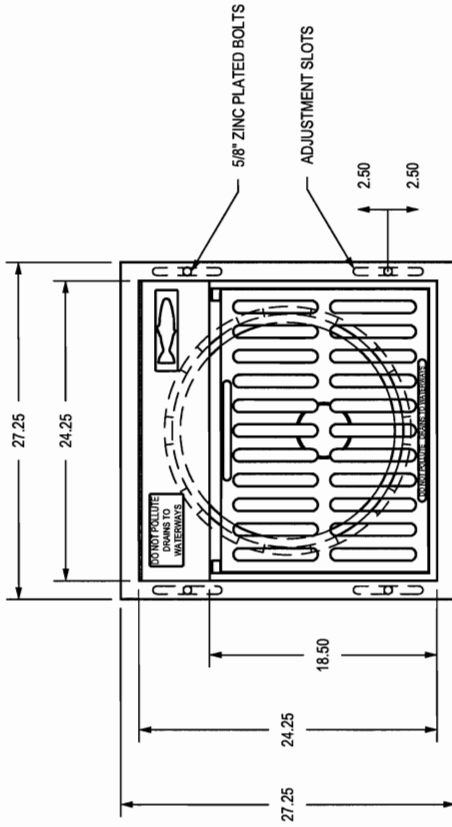
DETAIL NO.
539-2



BACKFILL MATERIAL SHALL BE CRUSHED ROCK PER SECTION 701.2.1 PLACED UNIFORMLY IN MAXIMUM 8" LIFTS & COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY PER SECTION 601.4.10 OR 1/2 SACK CLSM PER SECTION 728.

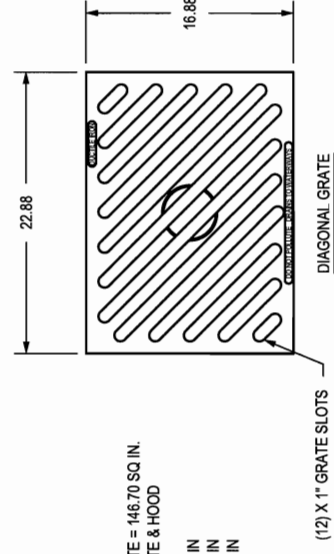
TOP VIEW





APPROX. DRAIN AREA OF STANDARD GRATE = 146.18 SQ IN.
 APPROX. DRAIN AREA OF STANDARD GRATE & HOOD

LOWEST SETTING = 227.37 SQ IN
 LOWEST + 1" SETTING = 248.25 SQ IN
 LOWEST + 2" SETTING = 269.12 SQ IN
 LOWEST + 3" SETTING = 290.00 SQ IN
 HIGHEST SETTING = 310.87 SQ IN

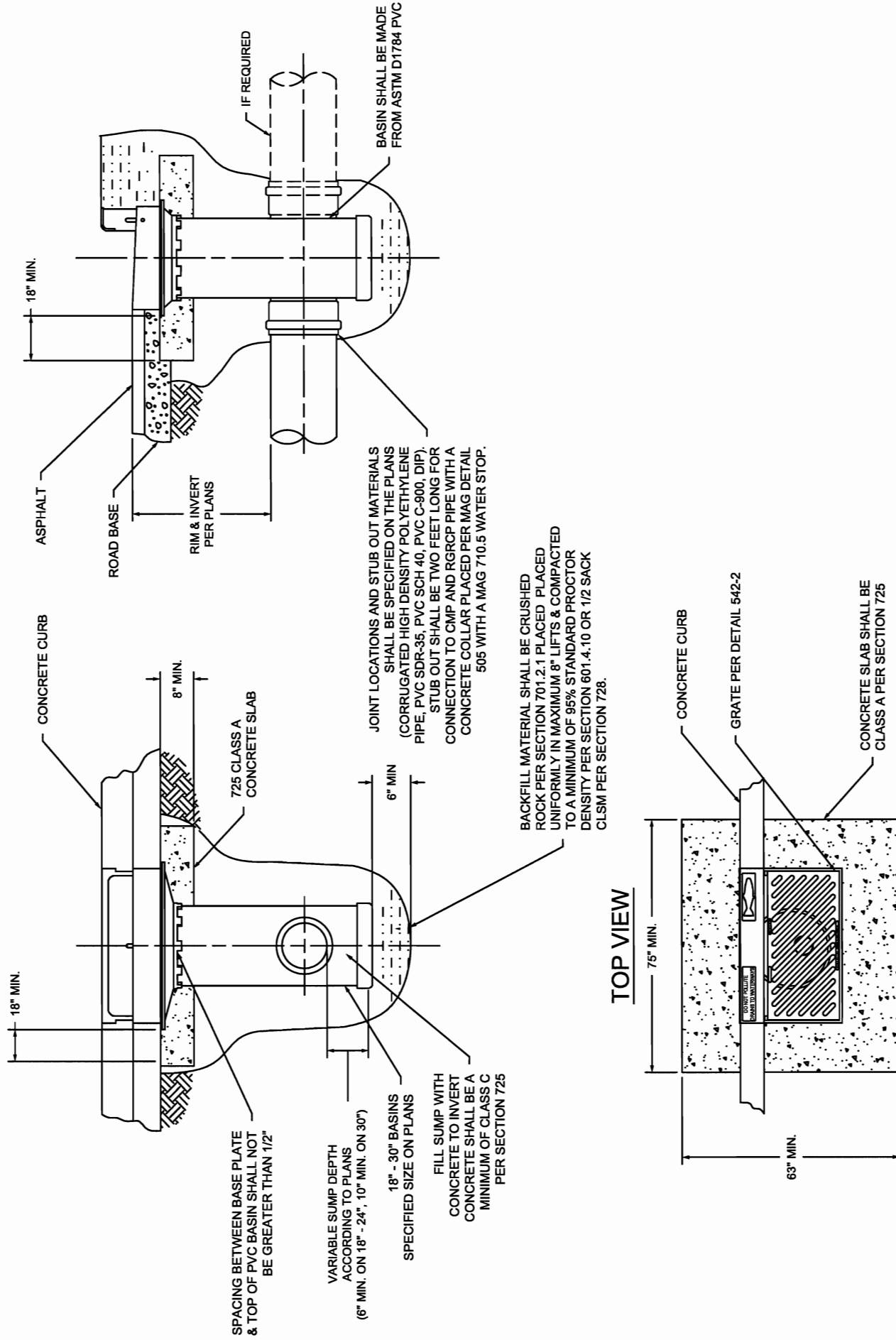


APPROX. DRAIN AREA OF DIAGONAL GRATE = 146.70 SQ IN.
 APPROX. DRAIN AREA OF DIAGONAL GRATE & HOOD

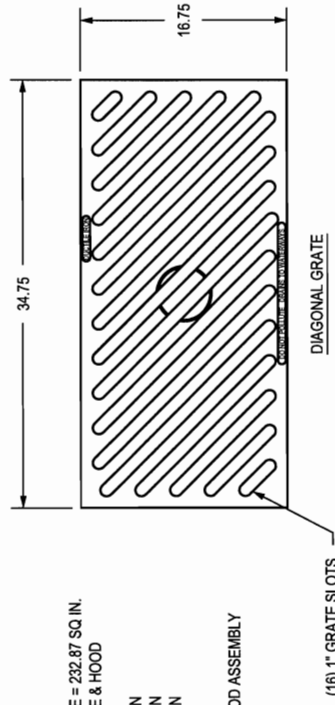
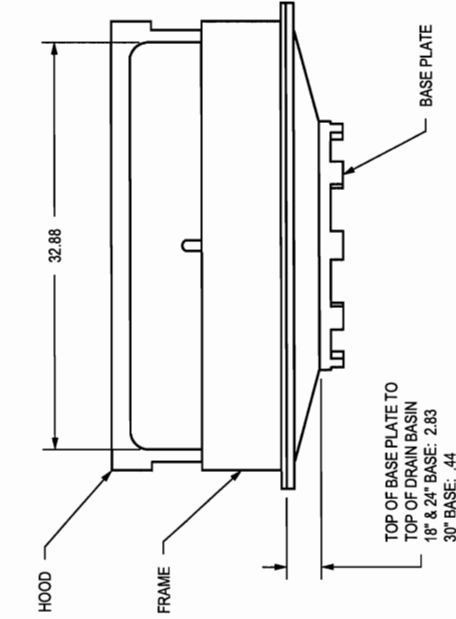
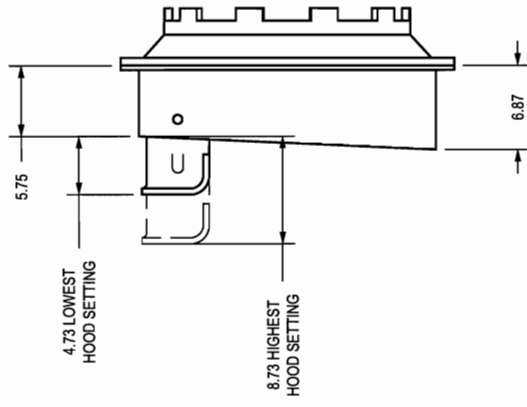
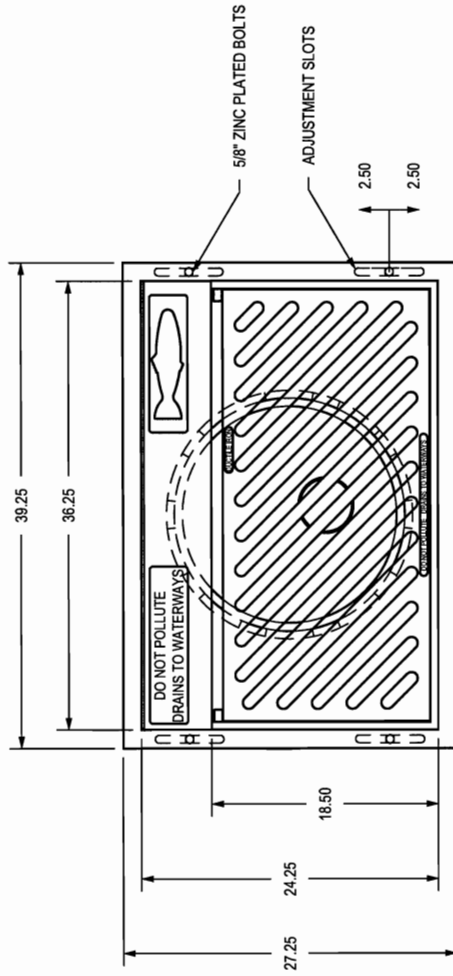
LOWEST SETTING = 227.89 SQ IN
 LOWEST + 1" SETTING = 248.77 SQ IN
 LOWEST + 2" SETTING = 269.64 SQ IN
 LOWEST + 3" SETTING = 290.52 SQ IN
 HIGHEST SETTING = 311.39 SQ IN

NOTES:

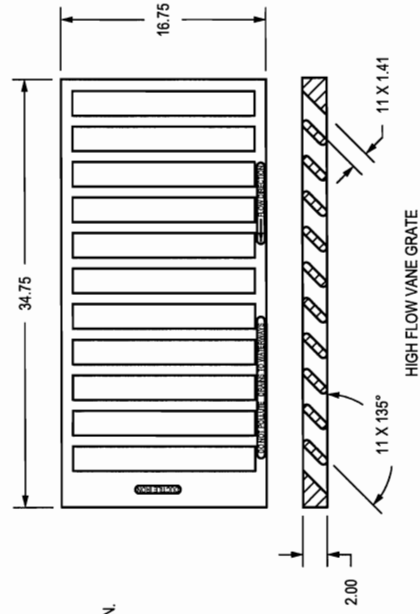
1. MATERIAL: DUCTILE IRON GRATE SHALL MEET H-20 LOAD
2. RATING & CONFORMING TO ASTM A536 GRADE 70-50-05
3. ALL CASTINGS ARE FURNISHED WITH BLACK PAINT AND ZINC PLATED FASTENERS
4. SLOPE OF GRATE SURFACE IS 5.2%
5. CURB INLET FRAME INSIDE VOLUME IS APPROX 1.76 CU FT



2' X 3' CURB INLET INSTALLATION DETAIL



APPROX. DRAIN AREA OF DIAGONAL GRATE = 232.87 SQ. IN.
 APPROX. DRAIN AREA OF DIAGONAL GRATE & HOOD
 LOWEST SETTING = 389.54 SQ. IN.
 LOWEST + 1" SETTING = 402.41 SQ. IN.
 LOWEST + 2" SETTING = 435.29 SQ. IN.
 LOWEST + 3" SETTING = 488.16 SQ. IN.
 HIGHEST SETTING = 501.04 SQ. IN.
 APPROX. WEIGHT OF GRATE = 112.5 LBS.
 APPROX. WEIGHT OF GRATE, FRAME & HOOD ASSEMBLY
 W/ 18" BASE = 477.5 LBS.
 W/ 24" BASE = 488.0 LBS.
 W/ 30" BASE = 438.5 LBS.



APPROX. DRAIN AREA OF DIAGONAL GRATE = 327.25 SQ. IN.
 APPROX. DRAIN AREA OF DIAGONAL GRATE & HOOD
 LOWEST SETTING = 463.92 SQ. IN.
 LOWEST + 1" SETTING = 486.79 SQ. IN.
 LOWEST + 2" SETTING = 529.67 SQ. IN.
 LOWEST + 3" SETTING = 562.54 SQ. IN.
 HIGHEST SETTING = 595.42 SQ. IN.
 APPROX. WEIGHT OF GRATE = 123.0 LBS.
 APPROX. WEIGHT OF GRATE, FRAME & HOOD ASSEMBLY
 W/ 18" BASE = 488.0 LBS.
 W/ 24" BASE = 476.5 LBS.
 W/ 30" BASE = 447.0 LBS.

- NOTES:
1. MATERIAL: DUCTILE IRON GRATE SHALL MEET H-20 LOAD
 2. RATING & CONFORMING TO ASTM A536 GRADE 70-50-05
 3. ALL CASTINGS ARE FURNISHED WITH BLACK PAINT AND ZINC PLATED FASTENERS
 4. SLOPE OF GRATE SURFACE IS 5.2%
 5. CURB INLET FRAME INSIDE VOLUME IS APPROX 2.73 CU FT



MEMORANDUM

Date: 2/6/08

To: Dale Phelan

From: Peter Kandarlis

Re: MAG Case 07-03 – Suggested Changes and Comments

For Details 535-2, 567-2, 542-1 & 543-1

- Rewrite backfill note as follows:

Backfill material shall be either crushed rock per Section 701.2.1 placed per Section 601.4.10 or ½-sack CLSM per Section 728.
- Include the following paragraph as new Section 601.4.10

601.4.10 Backfill for HDPE Catch Basins: Backfill below and around HDPE catch basins shall be placed in maximum 8-inch lifts and thoroughly compacted to at least 95% of maximum density when tested and determined by AASHTO T-99, Method A, with the percent of density adjusted in accordance with the rock correction procedure for maximum density determination, MAG Detail 190, to compensate for the rock content larger than that which will pass a No. 4 sieve.
- Specify the type of concrete to fill the sump. Is the sump always filled with concrete or is this up to the specifier? If this is an option, note that concrete fill will be required if shown on the plans or in the special conditions.
- Show slab clearance dimensions on top view. Reference grate detail(s).
- Rewrite joint note to be more clear on intent (something like below):

Joint locations and stub out materials shall be as specified on the plans (CHDPE, PE, PVC, SDR, DIP). Stub out shall be 2 feet long for connection to CMP and RGRCP pipe with a concrete collar placed per MAG Detail 505.

For Details 535-2, & 537-2

- Rewrite concrete slab note as follows:

Concrete slab shall be Class A per Section 725.

For Details 542-1, & 543-1

- Show pipe extending under curb as dashed and note "if required"

Number notes in Details 535-3, 539-2, 542-2, 543-2 & 543-5



**TOWN OF
QUEEN CREEK**

Case 07-08

Date: May 2, 2007

To: MAG Specifications and Details Committee

From: Tom Narva, Senior Project Manager for Sewer and Water construction, Town of Queen Creek. Presented by Gerald L. Wright, Town of Queen Creek MAG Specifications and Details representative

Subject: Line and Grade pipe tolerance

PURPOSE:

I have debated this issue with others over the years and now that we have a MAG committee member with us, I request you get a clarification to the boxed area of the attachment.

I know that several municipalities in the valley have interpreted this paragraph in error, in my opinion, for many years. They read this as the allowable depth of water in a sag of a sewer pipe during a TV inspection. I feel that the interpretation of this paragraph is that the line (plan view from above) and grade (profile view from the side) be within the tolerances given. The line part, again in my opinion, is not as critical as the grade part of the paragraph. In most cases the profile of the sewer is a straight line between the invert elevations on the design at the manholes or the slope of the line. I read this paragraph as any spot on that grade line or slope needs to be within the tolerances provided. So if you are installing an 18" pipe at minimum slope or 0.0011, the design change in elevation from one end of a 20' length of pipe to the other end is 0.022' (about a 1/4 inch). With a tolerance of 0.10' +/- at any point on the grade line or slope, at the design upstream end of the pipe could be 0.10' low and the design downstream end of the pipe could be 0.10' high and still be within tolerance. The resulting math tells me the design upstream end of the pipe would have 0.178' or 2.136" of water in the sag and still be within tolerance.

I am not saying that this paragraph should be replaced, but that another paragraph should be added right after it, giving the depth of water in a TV inspection of a sewer line allowable for a given size of sewer. This will strengthen the municipalities' position on sags in sewer pipe and what is permitted in our sewers.

Tom Narva

Example: 0.05 feet (5/8 inch) for 8 inches through 12 inches
0.10 feet (1 1/4 inches) for pipe greater than 15 inches

Ponding water in excess of the allowable tolerance will be cause for rejection.

SECTION 615

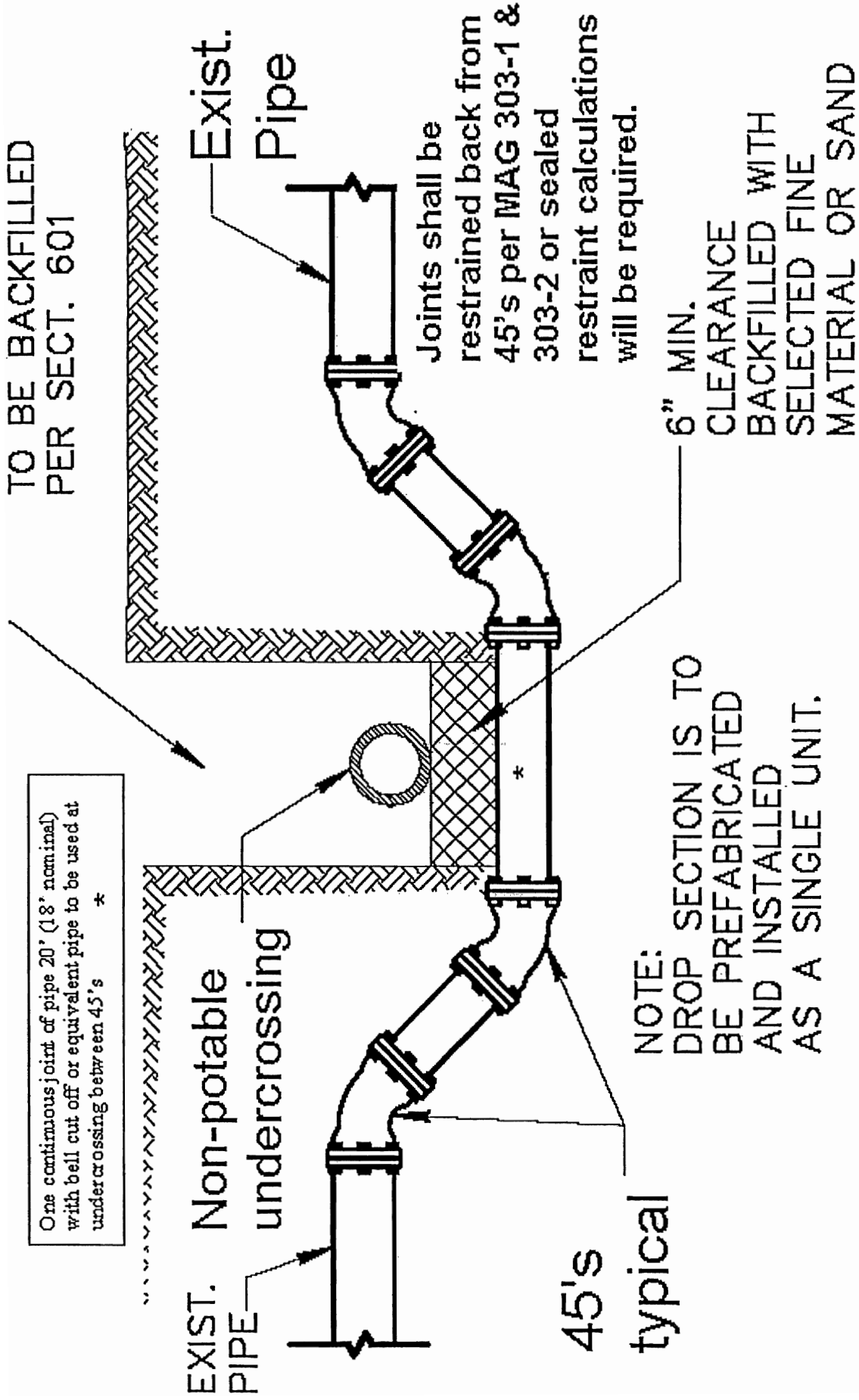
(D) Closed Circuit T.V. Inspection:

The Contracting Agency reserves the right to visually inspect the interior of the sewer line using a television camera. Any defects in the pipe or construction methods revealed shall be corrected by the Contractor at no additional cost to the Contracting Agency.

Insert this paragraph:

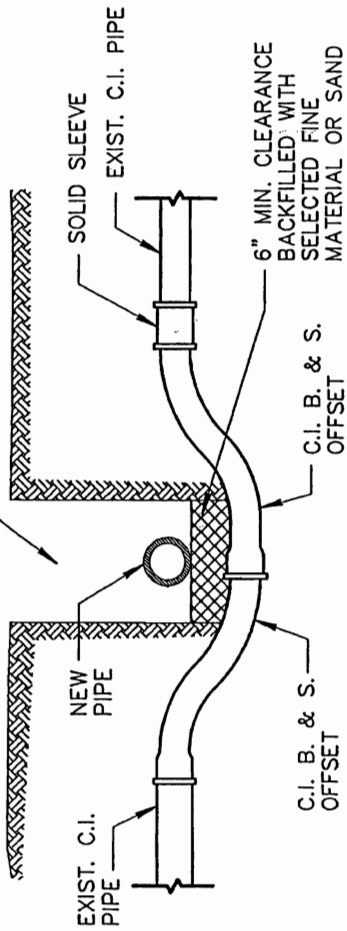
The maximum allowable depth of ponding water in sewer pipe 8 inches through 12 inches diameter is 5/8 inch. The maximum allowable depth of ponding water in sewer pipe 15 inches and greater diameter is 1 ¼ inches. Ponding water in excess of these allowable tolerances will be cause for rejection.

The Contracting Agency will pay for the initial T.V. inspection. Any additional inspection(s) required, due to the failure of the initial inspection, shall be paid for by the contractor.



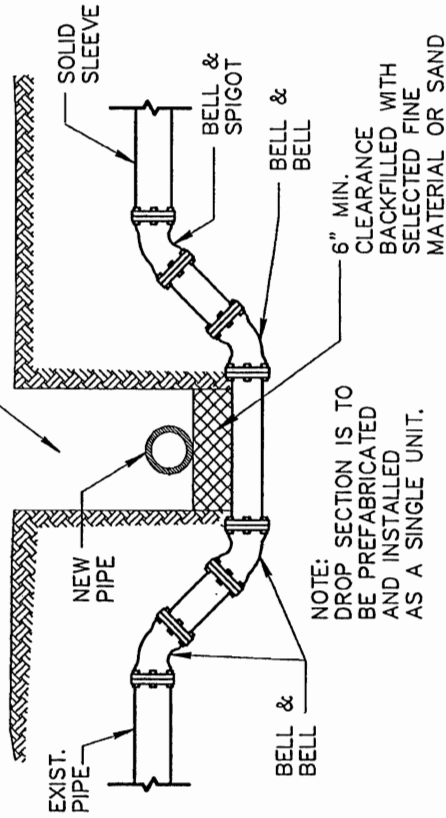
Ductile Iron MECHANICAL JOINT

REMAINDER OF TRENCH
TO BE BACKFILLED
PER SECT. 601



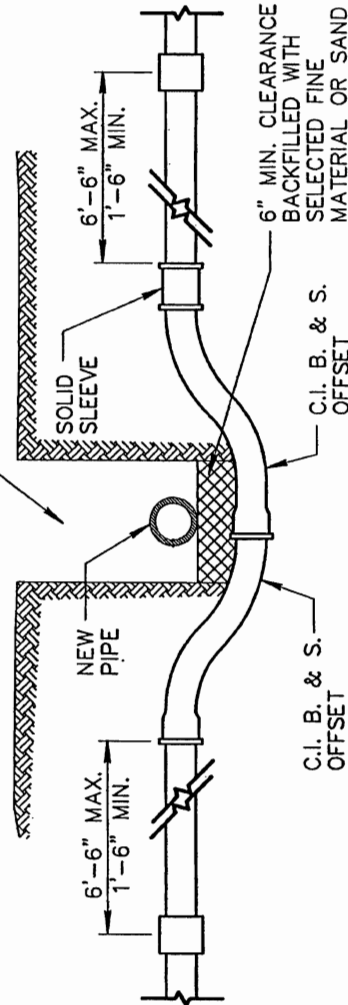
CAST IRON

REMAINDER OF TRENCH
TO BE BACKFILLED
PER SECT. 601



CAST IRON MECHANICAL JOINT

REMAINDER OF TRENCH
TO BE BACKFILLED
PER SECT. 601



ASBESTOS CEMENT

* SEE ADDITIONS / REVISIONS ON NEXT
PAGE.

NOTES:

1. THIS DETAIL COVERS MOVING OF WATER MAINS
2" TO 12" ONLY.
2. THRUST BLOCKING AS PER DET. 380 & 381.
3. IF OFFSET IS TO GO OVER OBSTRUCTION, JOINT
RESTRAINTS MUST BE USED.
4. PIPE IS TO BE CAST IRON OR DUCTILE IRON.

DETAIL NO.

370

REVISED

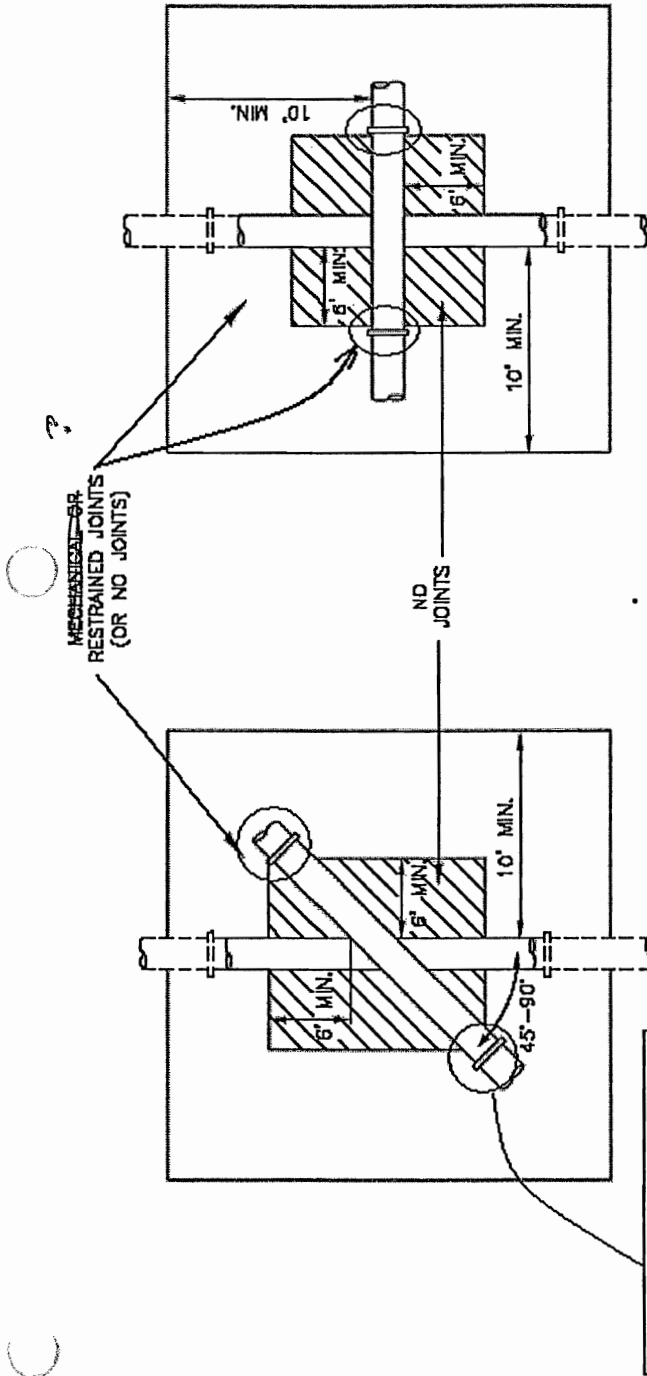
DETAIL NO.

370

STANDARD DETAIL
ENGLISH

VERTICAL REALIGNMENT OF WATER MAINS

MARICOPA
ASSOCIATION of
GOVERNMENTS



NOTES:

* REFER TO MAG STANDARD SPECIFICATION SECTION 610.

DETAIL NO. 404-2	MARIICOPA ASSOCIATION of GOVERNMENTS	STANDARD DETAIL ENGLISH	WATER AND SANITARY SEWER SEPARATION/PROTECTION	REVISED 01-01-2008	DETAIL NO. 404-2
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In the above detail it should be made clear that most pipe joints being used now days are 20' (18' nominal) and centering on joint of pipe under or over the crossing is what is desired. The goal is to have no fittings/couplings which are points of failure as far as cross-contamination under or over the crossing. Also the pipe is to be restrained at the first joint out of the "box".



MARICOPA COUNTY
Department of Transportation

MEMORANDUM

Date: January 2, 2008

To: MAG Specifications and Details Committee

From: Robert Herz, MCDOT Representative

Subject: Modification to Section 210 BORROW EXCAVATION

Case 08- 01

PURPOSE: Define acceptance criteria for imported borrow material.

REVISION: Add paragraph as noted.

210.2 IMPORTED BORROW:

Imported borrow shall consist of material required for construction and unless otherwise designated in the special provisions, the Contractor shall make his own arrangements for obtaining imported borrow and he shall pay all costs involved. Imported borrow shall be obtained from sources indicated on the plans, designated in the special provisions, or approved by the Engineer.

Borrow material for fill construction shall meet the following requirement:

The Plasticity Index (PI) (AASHTO T90) and the percent passing the Minus 200 sieve (ASTM C136) when used in the equation below, shall give a value of X that does not exceed 62.

$$X = (\text{Minus 200}) + 2.83 (PI)$$

The material shall be free from wood, vegetation, or other deleterious matter. The maximum size of this material shall not be greater than 2/3 the compacted thickness of the course placed in the subgrade.

The Contractor shall notify the Engineer sufficiently in advance of opening any material sites so that cross section elevations and measurements of the ground surface after stripping may be taken and sufficient time for testing and material will be allowed.

Borrow pits shall be excavated to regular lines to permit accurate measurement; depth of excavation throughout the area of borrow pits shall be as uniform as practicable and the side slope shall be dressed to such slope as may be directed, leaving the borrow pit area in a clean and safe condition.



MEMORANDUM

Date: 2/6/08

To: Robert Herz

From: Peter Kandarís

Re: MAG Case 08-01 – Suggested Changes and Comments

In addition to the suggested changes, SRP recommends the following additional requirements be included for import borrow:

- Suitable fill shall meet the following requirements:
 - (a) Liquid Limit (LL), per ASTM D4318, less than 50.
 - (b) Can be field compacted to at least the specified minimum densities.
- All borrow material for fill shall be stable, meet compaction requirements and be acceptable to the Engineer. Unstable material includes silt and clay soils with a moisture content so significantly over optimum that cannot be compacted to the required maximum density.



MARICOPA COUNTY
Department of Transportation

MEMORANDUM

Date: January 2, 2008

To: MAG Specifications and Details Committee

From: Robert Herz, MCDOT Representative

Subject: 317 Asphalt Milling

Case 08- 02

PURPOSE: Incorporate specifications from MCDOT's Supplement into the MAG specifications as requested by the MAG Standards & Details Consolidation Subcommittee.

REVISION: Add to Part 300: Section 317 Asphalt Milling.

SECTION 317

ASPHALT MILLING

317.1 DESCRIPTION:

The work under this Section shall consist of milling existing asphalt concrete pavement where shown on the Plans or requested by the Engineer.

317.2 CONSTRUCTION REQUIREMENTS:

Contractor is responsible for locating all milling hazards on and below the surface within the area to be milled including areas requiring special milling. Special milling is not a separate pay item and shall be paid for as Asphalt Milling.

The milling cut depth shall be the depth indicated on the Plans plus or minus 1/8 inch. Contractor shall remove the milled material and sweep the roadway clean with a power pick-up broom to the satisfaction of the Engineer.

Asphalt pavement adjacent to manholes, valve boxes, small radius curbs and other fixed objects that produce confined areas shall be removed with milling equipment specifically designed to operate in restricted areas. The equipment shall be capable of removing asphalt concrete of the specified thickness without damage to, or displacement of, the adjacent object(s).

The work shall result in a clean milled surface to the specified depth for the area indicated by the construction documents including the areas immediately around and next to any individual hazard within the area to be milled.

The Contractor shall be responsible for continually checking the milling operation to determine that the proper depth of milling has been achieved, that the proper profile and cross slope are achieved, and that the surface texture is (a) free from longitudinal ridges, and (b) has a uniform pattern.

317.3 MEASUREMENT AND PAYMENT:

Measurement for Asphalt Milling will be by the square yard and shall only include areas milled to the required depth and cross section.

Payment for Asphalt Milling at the contract unit price shall be full compensation for the work, complete-in-place, including all asphalt milling, milling around structures, removal and disposal of milled materials, and sweeping.



MEMORANDUM

Date: 2/6/08

To: Robert Herz

From: Peter Kandaris

Re: MAG Case 08-02 – Suggested Changes and Comments

In addition to the suggested changes, SRP recommends the following additional requirements be included for asphalt milling:

- Milling machine shall be self-propelled and shall have sufficient power, traction and stability to maintain an accurate depth of cut.
- Hauling equipment shall be available to receive milled material directly from the milling machine or loaded with a windrow of milled material when approved by the Engineer, and haul it directly to the stockpile.
- Equipment for removing any loose material during the sweeping operation shall have the capability to pick the material up off the milled and/or adjacent roadway and be able to be unloaded into the hauling equipment.
- Dust produced shall be controlled to a level that is in compliance with all federal, state and local regulations.
- The milling equipment shall be operated and maintained in such a manner that tearing and breaking out of the underlying and adjacent material is minimized.



MARICOPA COUNTY
Department of Transportation

MEMORANDUM

Date: January 2, 2008

To: MAG Specifications and Details Committee

From: Robert Herz, MCDOT Representative

Subject: 325 Asphalt - Rubber Concrete Overlay, Gap Graded

Case 08- 03

PURPOSE: Incorporate specifications from MCDOT's Supplement into the MAG specifications as requested by the MAG Standards & Details Consolidation Subcommittee.

REVISION: Add to Part 300: Section 325 Asphalt-Rubber Concrete Overlay, Gap Graded.

SECTION 325

ASPHALT-RUBBER CONCRETE OVERLAY, GAP GRADED

325.1 DESCRIPTION:

Asphalt-rubber concrete consists of supplying, placing and compaction of plant mixed gap graded asphalt-rubber concrete over asphalt surfaces. The thickness shall be as shown on the plans or as specified in the special provisions.

325.2 MATERIALS:

Asphalt-rubber concrete shall consist of a mixture of aggregate and asphalt-rubber binder. Tack coat, asphalt-rubber concrete mix and transportation thereof shall be as specified in Sections 710 and 321, except as modified below:

325.2.1 AGGREGATE:

The aggregate shall meet the following gradation:

Overlay Thickness <u>Sieve Size</u>	<u>1" & 1-1/2"</u> <u>Percent Passing</u>	<u>2"</u> <u>Percent Passing</u>
25 mm (1")	100	100
19 mm (3/4")	100	97-100
12.5 mm (1/2")	100	78-92
9.5 mm (3/8")	78-92	61-75
4.745 mm (#4)	28-42	30-40
2.36 mm (#8)	15-25	15-25
600 µm (#30)	5-15	5-15
75 µm (#200)	3-7	2-6
*Type II portland cement Or	1.5%	
*Hydrated Lime	1.0%	

***By total weight of the mineral aggregate.**

The aggregate shall conform to the requirements of MAG 701 and 710 for asphalt concrete, except as modified below:

Sand Equivalent	65 minimum
Crushed Aggregate (retained on 2.36 mm (#8) sieve, at least one crushed face, produced by crushing)	85 minimum

325.2.2 ASPHALT-RUBBER BINDER:

The asphalt-rubber binder shall conform to Section 717.

325.2.3 MIX DESIGNS:

At the Pre-Construction Meeting, the Contractor shall submit the name of the asphalt-rubber concrete supplier, a description of the materials, and the job mix design(s). The design method used shall be in accordance with the Marshall Mix procedure, 75 blows, as described in "Design Methods for Hot-Mixed Asphalt-Rubber Concrete Paving Materials" by James G. Chehovits, October 1989. The job mix designs are subject to approval by the Engineer.

Asphalt Rubber Binder Content:

The percent of asphalt-rubber binder in the mix(es) shall be within the following range:

Overlay Thickness	Asphalt Rubber Binder	
	High Traffic	Low Traffic
1" and 1-1/2"	8.0% to 8.4%	8.4% to 8.8%
2"	7.1% to 7.4%	N/A

The amount of asphalt-rubber binder in each mix shall be provided in the design subject to approval by the Engineer. Low traffic areas include residential streets. High traffic areas include arterial streets.

Air Voids:

The percent of air voids in the mix(es) shall be within the following range:

Overlay Traffic Volume	Air Voids
Low Traffic	3.0% to 5.0%
High Traffic	4.0% to 6.0%

The amount of air voids in each mix shall be provided in the design subject to approval by the Engineer.

Mix designs shall include the following information as a minimum:

1. Aggregate
 - Source and identification (for each material used)
 - Gradation (for each material used)
 - Blend percentage
 - Mixture gradation

2. Asphalt - Rubber Binder (No extender oil allowed)
 - Source and PG grade of asphalt cement
 - Source and identification of ground rubber
 - Ground rubber gradation
 - Ground rubber percentage of the asphalt - rubber binder
 - Type and amount of additive(s), if required
 - Temperature when added to aggregate
3. Recommended asphalt - rubber binder content by both weight of total mix and by weight of dry aggregate.
4. Recommendations for maximum / minimum temperatures during material production and lay down; and the allowable ambient air and existing pavement surface temperatures during lay down.

The mix design shall include sufficient test results and documentation to assure that all requirements for rubber, aggregate and the asphalt-rubber binder are fulfilled.

325.2.4 Production Tolerance:

Production requirements for asphalt-rubber concrete shall be as specified in Section 710.4.4 Volumetrics, Section 710.5.1 Quality Control, and Section 321.6 Corrective Requirements for Deficiencies. The production tolerances including compaction requirements and corrective action will be enforced for asphalt-rubber concrete.

Calibration Factors

A minimum of one week prior to the production of asphalt rubber hot mix, the Contractor shall submit to the Engineer samples of all hot mix materials that will be used on the project. The materials shall be used to determine the calibration factors using the acceptance laboratory and the Contractor supplied ignition furnaces and related quality control test equipment. Calibration factors shall be recalculated whenever a change in the asphalt rubber hot mix materials occurs and when requested by the Engineer.

325.3 SURFACE PREPARATION:

Before placing asphalt-rubber concrete on existing pavements, severely raveled areas or cracked areas that are depressed more than 3/4" from the adjoining pavement shall be cut out and patched at least 48 hours prior to the resurfacing operation. Over-asphalted (bleeding or flushing) areas or rough high spots shall be removed by burning or blading. Large shrinkage cracks shall be filled with asphalt sealing compound acceptable to the Engineer. The entire surface shall be cleaned with a power broom. Raveled areas that do not require removing shall be cleaned by hand brooming. The above surface cleaning requirements are included as part of the Asphalt-Rubber Concrete paving operations, and the cost thereof shall be included in the Asphalt-

Rubber Concrete pay item. Pavement repairs and crack sealing when required are to be compensated for by other appropriate contract pay items.

Prior to placing the asphalt-rubber concrete on milled surfaces, pot-holes left by the milling operation shall be repaired by the Contractor, as a related non-pay item and as required by the Engineer. The milled area shall be swept.

After surfaces have been prepared to the satisfaction of the Engineer, they shall receive a tack coat as specified in Section 321.

Traffic will not be permitted over surfaces which have received a tack coat. When the overlay is to extend onto a concrete surface, the concrete surface shall be thoroughly cleaned of loose dust and cement particles and shall be tack coated.

325.4 CONSTRUCTION METHODS:

Asphalt-rubber concrete shall be placed only when the surface is dry, and when the atmospheric temperature in the shade is 55° F or above. No asphalt-rubber concrete shall be placed when the weather is foggy or rainy. Asphalt-rubber concrete shall be placed only when the Engineer determines that weather conditions are suitable.

Except as otherwise noted, placing and rolling of the asphalt-rubber concrete and the smoothness of the surface shall be as specified in Section 321 for asphalt concrete. The spreading equipment shall be equipped with a mat reference ski-type control device of not less than 30 feet in length, or other method of control approved by the Engineer.

The density of the compacted mixture shall not be less than 95% of the laboratory unit weight composed of the same mixture compacted by the 75 blow method of ASTM D-1559 at 290° F \pm 5° F, or at the job mix design specified compaction temperature. Pneumatic rollers shall not be used.

Placement and compaction temperature shall be specified with the submitted mix design data but in no case less than 275° F at the point of placement. The temperature of the material in the truck shall be measured by inserting a thermometer, or other approved measuring device, to a point at least 6" below the surface of material.

If asphalt-rubber concrete is placed in a windrow during paving, the windrow shall not exceed a distance greater than 150 feet in front of the paving machine.

325.4.1 Lime Water:

An application of lime water shall be applied by the Contractor to the compacted asphalt rubber concrete surface after final compaction, prior to opening the roadway to traffic, or when requested by the Engineer to cool the pavement to prevent tracking and pick-up. The lime water solution shall be applied at the rate of approximately 1/2 gallon/square

yard. The lime shall be mixed using a minimum of (1) one, 50-pound bag per 3,000 gallons of water.

325.4.2 Corrective Requirements for Deficiencies:

Corrective measures shall be as specified in Section 321.6 Corrective Requirements for Deficiencies and in Section 710.4.4 Volumetrics.

325.4.3 Adjustments:

After installation of an overlay course:

All necessary frame and cover adjustments for manholes, valves, survey monuments, sewer clean-outs, etc., shall be completed by the Contractor within the given segments being surfaced.

On roads without curb and gutter, the existing shoulder elevation shall be adjusted by the Contractor to match the elevation at the edge of new overlay and slope away from new pavement surface at a rate that the existing quantity of shoulder material will allow. Shoulder material includes the existing shoulder, millings, untreated base materials, or a granular material approved by the Engineer. Shoulder material shall be compacted to a minimum of 95% of maximum density, determined in accordance with section 301.3.

325.5 MEASUREMENT:

Asphalt-Rubber Concrete shall be measured by the ton, for the mixture actually used, which shall include the required quantities of mineral aggregates, filler material, rubberized asphalt binder and anti-strip agent.

Application of Lime Water shall be measured by the square yard. The measured area shall be the area of asphalt-rubber pavement to which the lime water is applied. The measured area shall only be counted one time regardless of the number of applications applied to the asphalt-rubber pavement section.

325.6 PAYMENT:

Payment for Asphalt Milling will be as specified in Section 317.

Payment for Tack Coat will be as specified in Section 321.

Payment for Asphalt - Rubber Concrete will be at the contract unit price, complete in place.

Application of Lime Water as approved by the Engineer will be paid at the contract unit price.



MEMORANDUM

Public Works Department – Memo No. ST08-019

DATE: December 27, 2007

TO: MAG Specifications and Details Committee

FROM: David E. Fern, Transportation Operations Manager

SUBJECT: Proposed Addition to MAG Standard Details

PURPOSE: Consolidate City Standards Into MAG Specifications and Details

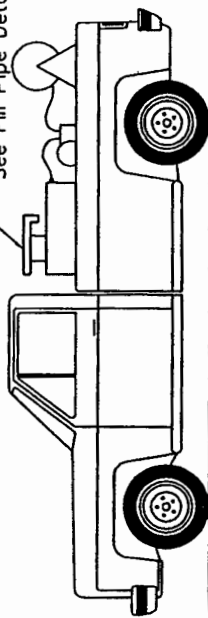
DISCUSSION: The MAG Specifications and Details Committee contracted with a consultant to group and summarize all current MAG membership agency details/specifications in order to expedite further consolidation of various agency exceptions as either additions or modifications to existing MAG Standards and Details.

One such standard detail that is currently not included in the MAG Standard Specifications and Details is one for a fill pipe detail for portable tanks with or without air gap separation. The current municipal details by City of Chandler, City of Goodyear, City of Mesa, and City of Scottsdale can be deleted and added as one two (2) page detail in the 100 Series of the MAG Standard Details section.

The benefit for the agencies and for the contracting community would be a reduction from the current seven (7) Standard Detail pages down to only two (2) MAG Standard Detail pages. The new MAG details would contain all the relevant information currently identified by all the duplicated agency details.

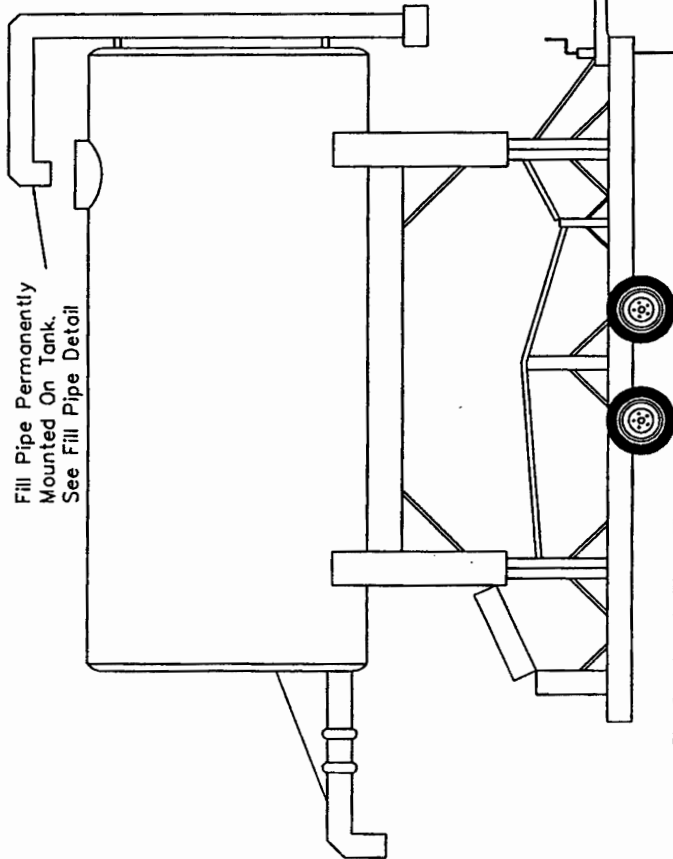
c: R.J. Zeder, Sheina Hughes, File

Fill Pipe Permanently Mounted On Tank. See Fill Pipe Detail



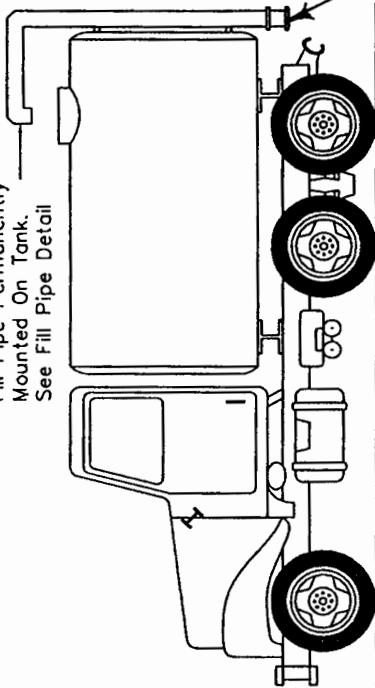
PESTICIDE APPLICATOR TRUCK

Fill Pipe Permanently Mounted On Tank. See Fill Pipe Detail



ELEVATED TANK

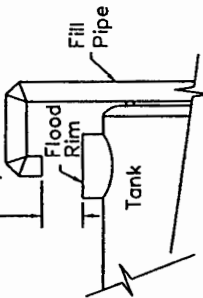
Fill Pipe Permanently Mounted On Tank. See Fill Pipe Detail



WATER TRUCK

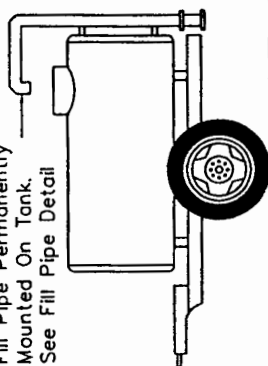
Handwritten: hose connection

Twice The Diameter Of Fill Pipe Above Flood Rim.



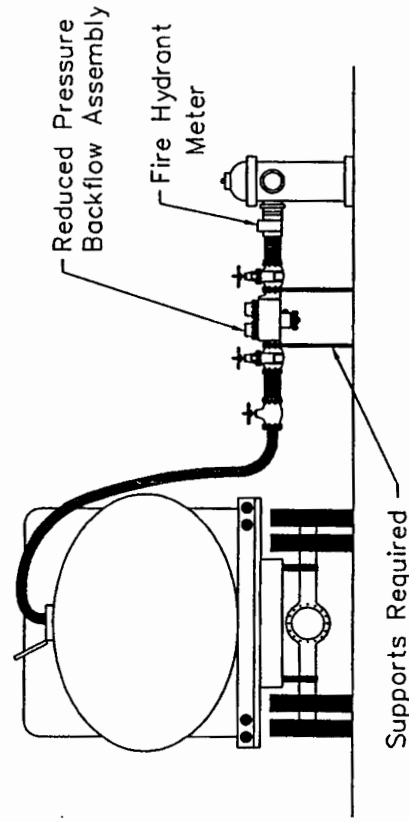
FILL PIPE DETAIL

Fill Pipe Permanently Mounted On Tank. See Fill Pipe Detail

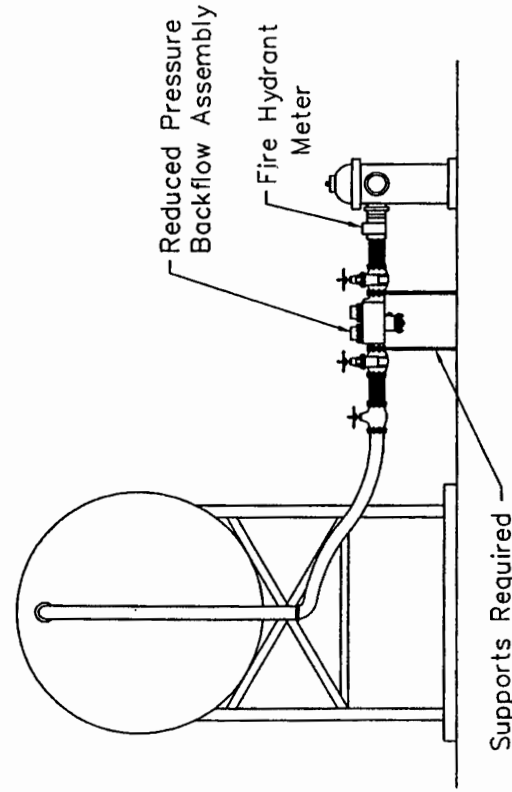
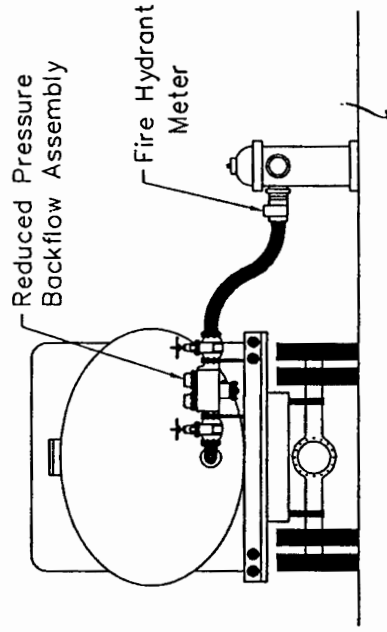


WATER WAGON

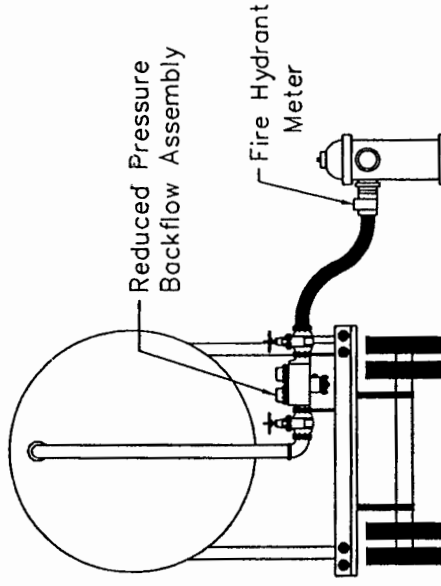
DETAIL NO. <i>180-1</i>	APPROVED BY: <i>Mariopg Association of Governments</i>	FILL PIPE DETAILS FOR PORTABLE TANKS WITH AIR GAP SEPARATION	DETAIL NO.
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TANK TRUCKS



ELEVATED TANKS



NOTE: Reduced Backflow Device Per Agency Requirement

DETAIL NO.

180-2

APPROVED BY:

Michigan Association of Governments

DETAIL NO.

BACKFLOW PREVENTION METHOD FOR PORTABLE TANKS
WITH NO AIR GAP SEPARATION

100 SERIES: GENERAL INFORMATION

- 101 GENERAL INFORMATION
- 110 PLAN SYMBOLS
- 112 DIMENSIONING FOR ROAD IMPROVEMENT PLANS
- 120-1 SURVEY MARKER
- 120-2 SURVEY MARKER (FOR UNINCORPORATED AREAS OF THE COUNTY)
- 130 BARRICADES
- 131 STREET SIGN BASE
- 135-1 STEEL GUARD RAIL
- 135-2 STEEL GUARD RAIL
- 135-3 STEEL GUARD RAIL
- 135-4 STEEL GUARD RAIL
- 140 SAFETY POST
- 145 SAFETY RAIL
- 150 PRECAST SAFETY CURB
- 160 6" CHAIN LINK FENCE AND GATE
- 170 TYPICAL RUNWAY OR TAXIWAY LIGHTING DETAIL
- 180 ROCK CORRECTION PROCEDURE FOR MAXIMUM DENSITY DETERMINATION

(180-1 Fill Pipe Details For Portable Tanks with Air Gap Separation)
(180-2 Ball Valves Prevention Method For Portable Air Tanks With No Air Gap Separation)

200 SERIES: STREET INFORMATION

- 200 BACKFILL, PAVEMENT AND SURFACE REPLACEMENT
- 201 PAVEMENT SECTION AT TERMINATION
- 202 ALLEY DETAILS (PAVED AND UNPAVED)
- 203 SCUPPERS
- 204 EQUIPMENT CROSSING
- 205 PAVED TURNOUTS
- 206-1 CONCRETE SCUPPER
- 206-2 CONCRETE SCUPPER
- 210 RESIDENTIAL SPEED HUMP
- 211 STANDARD TRENCH PLATING DETAIL
- 212 UTILITY POTHOLE REPAIR
- 220 CURB AND GUTTER - TYPES 'A', 'B', 'C', AND 'D'
- 221 CURB AND GUTTER (TRANSITION, INTEGRAL AND WARNING BEACON)
- 222 SINGLE CURB - TYPES 'A', 'B' AND TERMINATION
- 223 MEDIAN NOSE TRANSITION
- 224 JOINT FOR DRAINAGE INLETS AND MANHOLE COVERS
- 225 CONCRETE PAVERS
- 230 SIDEWALKS
- 231 SIDEWALK RAMPS - TYPE 'A'
- 232 SIDEWALK RAMPS - TYPE 'B'
- 233 SIDEWALK RAMPS - TYPE 'C'

200 SERIES: STREET INFORMATION (CONTINUED)

- 234 SIDEWALK RAMPS - TYPE 'D'
- 240 VALLEY GUTTER
- 250 DRIVEWAY ENTRANCES
- 251 RETURN TYPE DRIVEWAYS
- 252 BUS AND PARKING BAYS
- 260 ALLEY ENTRANCE (WITH COMBINED CURB AND GUTTER)
- 261 ALLEY ENTRANCE (WITH ROLL TYPE CURB AND GUTTER)
- 262 WING TYPE ALLEY ENTRANCE (WITH COMB. CURB & GUTTER)
- 263 WING TYPE ALLEY ENTRANCE (WITH ROLL CURB & GUTTER)
- 270 FRAME AND COVER (AND GRADE ADJUSTMENTS)

300 SERIES: WATER INFORMATION

- 301 BLOCKING FOR WATER GATE AND BUTTERFLY VALVES
- 302-1 JOINT RESTRAINT WITH TIE RODS
- 302-2 JOINT RESTRAINT WITH TIE RODS
- 303-1 JOINT RESTRAINT FOR DUCTILE IRON AND POLYETHYLENE WRAPPED DUCTILE IRON WATER PIPES
- 303-2 JOINT RESTRAINT FOR DUCTILE IRON AND POLYETHYLENE WRAPPED DUCTILE IRON WATER PIPES
- 310 CAST IRON WATER METER BOX COVER NO. 1
- 311 CAST IRON WATER METER BOX COVER NO. 2
- 312 CAST IRON WATER METER BOX COVER NO. 3
- 313 CAST IRON WATER METER BOX COVER NO. 4
- 314 CAST IRON WATER METER BOX COVER NO. 5
- 320 CONCRETE WATER METER BOXES
- 321 STANDARD WATER METER VAULT
- 340 INSTALLING TAPPING SLEEVES AND VALVES
- 342 CONCRETE PRESSURE PIPE TAPPING SLEEVE
- 345-1 3" 4" 6" WATER METER
- 345-2 4" 6" WATER METER WITH ON-SITE FIRE HYDRANTS
- 346 FIRE LINE DETECTOR CHECK VAULT
- 360 FIRE HYDRANT INSTALLATION
- 362 LOCATIONS FOR NEW HYDRANTS
- 370 VERTICAL REALIGNMENT OF WATER MAINS
- 380 THRUST BLOCKS FOR WATER LINES
- 381 ANCHOR BLOCKS FOR VERTICAL BENDS
- 389 CURB STOP WITH VALVE BOX AND COVER
- 390 CURB STOP WITH FLUSHING PIPE
- 391-1 VALVE BOX INSTALLATION AND GRADE ADJUSTMENT
- 391-2 VALVE BOX INSTALLATION
- 392 DEBRIS CAP INSTALLATION

**MEMORANDUM****Public Works Department – Memo No. ST08-020**

DATE: December 27, 2007

TO: MAG Specifications and Details Committee

FROM: David E. Fern, Transportation Operations Manager

SUBJECT: Proposed Addition to MAG Standard Details

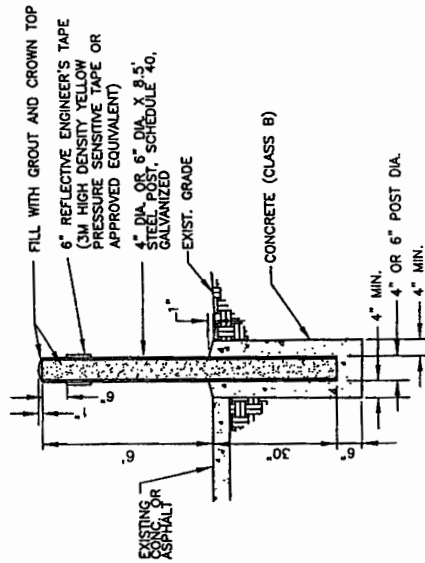
PURPOSE: Consolidate City Standards Into MAG Specifications and Details

DISCUSSION: The MAG Specifications and Details Committee contracted with a consultant to group and summarize all current MAG membership agency details/specifications in order to expedite further consolidation of various agency exceptions as either additions or modifications to existing MAG Standards and Details.

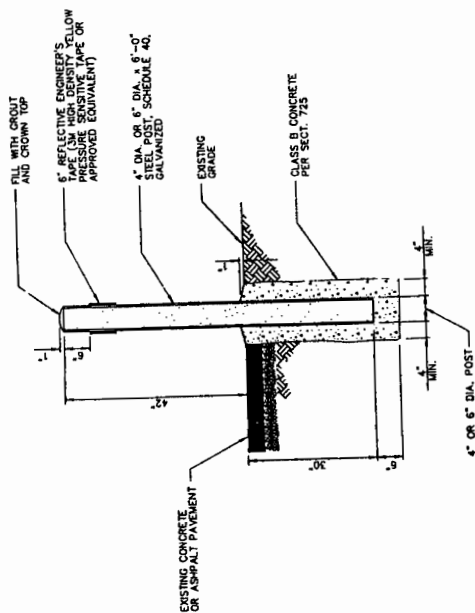
One such standard detail that is currently included in the MAG Standard Specifications and Details is MAG Detail 140 for safety post installations. This Detail is either modified or added to by the current municipal details in the City of Chandler and City of Mesa. The information in both these details can be deleted from the agency modifications/additions and added as a one (1) page detail in the 100 Series of the MAG Standard Details section.

The benefit for the agencies and for the contracting community would be a reduction from the current three and one-half (3.5) Standard Detail pages down to only one (1) MAG Standard Detail page. The new MAG detail would contain all added or modified relevant information currently identified by both agency detail supplements.

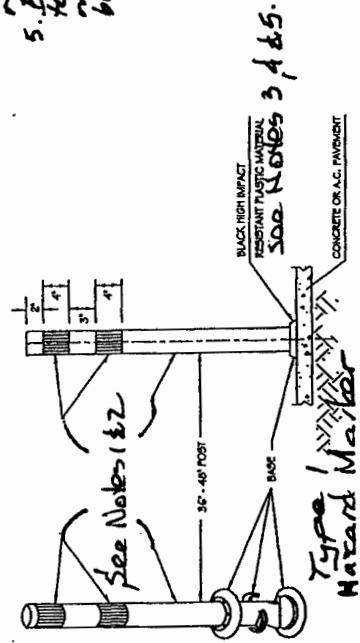
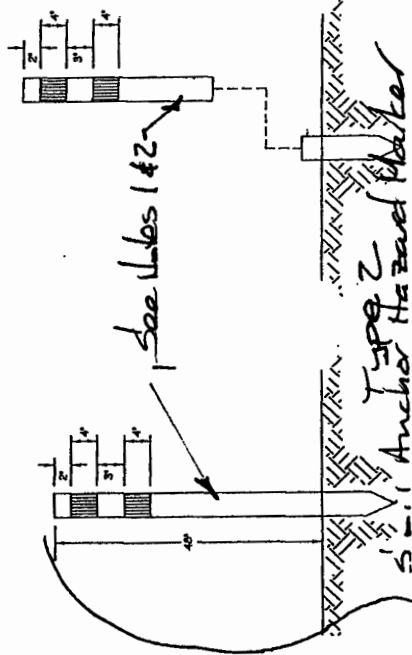
c: R.J. Zeder, Sheina Hughes, File



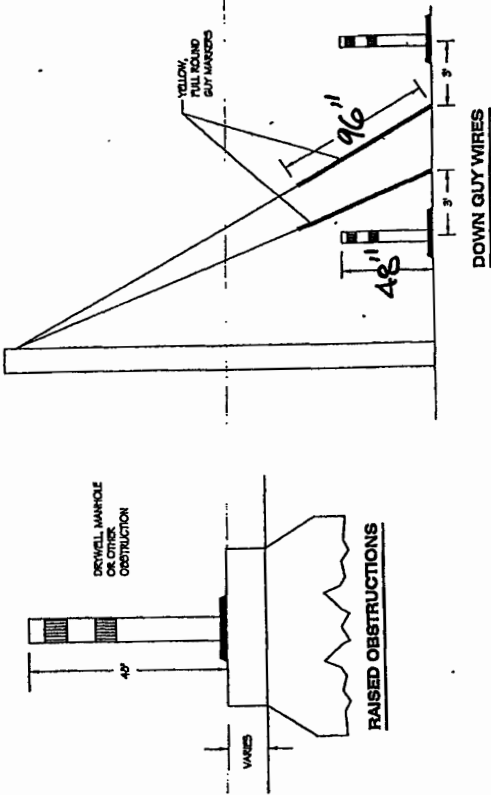
TYPE 2 SAFETY POST
N.T.S.



TYPE 1 SAFETY POST SECTION



- Notes:
1. Yellow tubular markers shall have a yellow post and yellow high intensity grade 1 shock. Orange tubular markers shall have an orange post and white high intensity reflective sheeting.
 2. Post shall be flexible, high impact resistant, plastic material.
 3. Contractor shall clean roadway surface prior to placement of flexible tubular marker.
 4. Flexible tubular markers shall be installed with an adhesive as per tubular marker manufacturer's recommendations.
 5. Base shall be cemented to surface with epoxy material as recommended by the manufacturer.



HAZARD MARKER

- NOTES:
1. HAZARD MARKERS SHALL BE INSTALLED WHEN AN OBSTRUCTION MAY POSE A HAZARD TO MOTORIZED VEHICLES, MOWING EQUIPMENT, PEDESTRIANS, MAINTENANCE OPERATIONS OR AS DIRECTED BY THE ENGINEER.
 2. HAZARD MARKERS SHALL MEET THOSE SPECIFICATIONS SHOWN **AT RIGHT**.
 3. **HAZARD MARKERS** MAY BE USED AROUND RAISED OBSTRUCTIONS AS AN ALTERNATE; HOWEVER, THREE (3) MARKERS MUST BE PLACED AT 120° INTERVALS AROUND THE OBSTRUCTION.

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101	GENERAL INFORMATION
110	PLAN SYMBOLS
112	DIMENSIONING FOR ROAD IMPROVEMENT PLANS
120-1	SURVEY MARKER
120-2	SURVEY MARKER (FOR UNINCORPORATED AREAS OF THE COUNTY)
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131	STREET SIGN BASE
135-1	STEEL GUARD RAIL
135-2	STEEL GUARD RAIL
135-3	STEEL GUARD RAIL
135-4	STEEL GUARD RAIL
140	SAFETY POST HAZARD MARKER <i>HAZARD MARKER</i>
145	SAFETY RAIL
150	PRECAST SAFETY CURB
160	6' CHAIN LINK FENCE AND GATE
170	TYPICAL RUNWAY OR TAXIWAY LIGHTING DETAIL
190	ROCK CORRECTION PROCEDURE FOR MAXIMUM DENSITY DETERMINATION

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200 SERIES: STREET INFORMATION (CONTINUED)

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262	WING TYPE ALLEY ENTRANCE (WITH COMB. CURB & GUTTER)
263	WING TYPE ALLEY ENTRANCE (WITH ROLL CURB & GUTTER)
270	FRAME AND COVER (AND GRADE ADJUSTMENTS)

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302-2	JOINT RESTRAINT WITH TIE RODS
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311	CAST IRON WATER METER BOX COVER NO. 2
312	CAST IRON WATER METER BOX COVER NO. 3
313	CAST IRON WATER METER BOX COVER NO. 4
314	CAST IRON WATER METER BOX COVER NO. 5
320	CONCRETE WATER METER BOXES
321	STANDARD WATER METER VAULT
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342	CONCRETE PRESSURE PIPE TAPPING SLEEVE
345-1	3" 4" 6" WATER METER
345-2	4" 6" WATER METER WITH ON-SITE FIRE HYDRANTS
346	FIRE LINE DETECTOR CHECK VAULT
360	FIRE HYDRANT INSTALLATION
362	LOCATIONS FOR NEW HYDRANTS
370	VERTICAL REALIGNMENT OF WATER MAINS
380	THRUST BLOCKS FOR WATER LINES
381	ANCHOR BLOCKS FOR VERTICAL BENDS
389	CURB STOP WITH VALVE BOX AND COVER
390	CURB STOP WITH FLUSHING PIPE
391-1	VALVE BOX INSTALLATION AND GRADE ADJUSTMENT
391-2	VALVE BOX INSTALLATION
392	DEBRIS CAP INSTALLATION

Selection Table For Signs

Sign Type	Post Size [Hole Size]	Post Form	Material	Post Embedment Into Anchor	Sleeve Size	Anchor Size	Sign Bury Depth	Fdn. Depth x Width and Type	Mounting Height Above Grade	Mounting Height To Sign Bottom	Lateral Sign Clearance-Edge	Sign Post Anchorage	Sign Mounting
Mesa:													
Type 1: Up to 2,000 Sq. In. of Sign Face	2" x 2" (12 Gauge) 12" Std.	Square	Galvanized	6"	2 1/2" x 2 1/2" x 18" (12 Gauge)	2 1/4" x 2 1/4" x 36" (12 Gauge)	Conc. Fdn.	36" x 12" Min. Conc. Class C	2 Holes Exposed	Per MUTCD	Per MUTCD, Plans or Back of SW; Post: 1.5'-4.0'	1 9/16" x 1 3/16" Thrd x 5/16" Dia.	1 1/32" x 3 1/32" x 5/16" Dia. Corner Bolt With 5/16" Self Locking Nut
Type 2: > 2,000 Sq. In. of Sign Face Double Post	2 ea 2" x 2" (12 Gauge) 12" Std.	Square	Galvanized	6"	2 ea 2 1/2" x 2 1/2" x 18" (12 Gauge)	2 ea 2 1/4" x 2 1/4" x 36" (12 Gauge)	Conc. Fdn.	36" x 12" Min. Conc. Class C	2 Holes Exposed	Per MUTCD	Per MUTCD, Plans or Back of SW; Post: 1.5'-4.0'	1 9/16" x 1 3/16" Thrd x 5/16" Dia.	1 1/32" x 3 1/32" x 5/16" Dia. Corner Bolt With 5/16" Self Locking Nut
Pecos:													
Type 1: Singular Signs	1 3/4" x 1 3/4" x 10' Per COP Specs [7/16" @ 1" OC both sides]	Square Perforated 0.105"	Galv Steel Tubing	[24"-28"] Min.		2" x 2" x 30' Min. Per COP Specs	29"		4'-6" Above Ground	Per MUTCD		1 11/32" x 1 31/32" Thrd Ea. End x 5/16" Dia. Corner Bolt With 5/16" Self Locking Nut	1 11/32" x 31/32" Thrd x 5/16" Dia. Corner Bolt With 5/16" Self Locking Nut
Type 2: Dual Signs	1 3/4" x 1 3/4" x 12' Per COP Specs [7/16" @ 1" OC both sides]	Square Perforated 0.105"	Galv Steel Tubing	[24"-28"] Min.		2" x 2" x 30' Min. Per COP Specs	29"		4'-6" Above Ground	Per MUTCD		1 11/32" x 1 31/32" Thrd Ea. End x 5/16" Dia. Corner Bolt With 5/16" Self Locking Nut	1 11/32" x 31/32" Thrd x 5/16" Dia. Corner Bolt With 5/16" Self Locking Nut
Type 3: Signs > 42" in Width	1 3/4" x 1 3/4" x 12' Per COP Specs [7/16" @ 1" OC both sides]	Square Perforated 0.105"	Galv Steel Tubing	[24"-28"] Min.		2 ea. 2" x 2" x 30' Min. Per COP Specs	29"		4'-6" Above Ground	Per MUTCD		1 11/32" x 1 31/32" Thrd Ea. End x 5/16" Dia. Corner Bolt With 5/16" Self Locking Nut	1 11/32" x 31/32" Thrd x 5/16" Dia. Corner Bolt With 5/16" Self Locking Nut
Town of Gilbert:													
Type 1: Signs < 1296 Sq. In.	1 3/4" x 1 3/4"	Square Perforated	Steel Tubing	6" Min. (2" Max. Above Ground)		2" x 2" 26" Min.	Conc. Fdn.	36" x 12" Min. Conc. Class C		7' Min. Delineators @ 4' Min. Below Sign			
Type 2: Signs > 1296 Sq. In.	2" x 2"	Square Perforated	Steel Tubing	6" Min. (2" Max. Above Ground)		2 1/4" x 2 1/4" 26" Min.	Conc. Fdn.	36" x 12" Min. Conc. Class C		7' Min. Delineators @ 4' Min. Below Sign			
City of Scottsdale:													
Type 1: Signs	1 3/4" x 1 3/4"	Square Perforated 0.105"	Galv. Steel Tubing (Green Finish)	19" Min. Supp 402.3	2 1/4" x 2 1/4" x 12" (Green Finish) Supp 402.3	2" x 2" x 36" Min. (Green Finish) Supp 402.3	35"			Per MUTCD or City	Back of Curb or SW: 2' Min.	1 11/32" x 1 31/32" Thrd Ea. End x 5/16" Dia. Corner Bolt With 5/16" Self Locking Nut	1 11/32" x 31/32" Thrd Ea. End x 5/16" Dia. Corner Bolt With 5/16" Self Locking Nut
MAG (Detail 131):													
Type A: Signs	Flanged Steel U Channel	U Channel	2 or 3 lbs per SF (Specs)	N/A	N/A	N/A	2.0'	Opt. Type B Fdn.		N/A	MAG DOT Detail 2038 & 2039	MAG DOT Detail 2039	MAG DOT Detail 2039
Type B: Signs	2 1/2" Dia. or 2 3/8" OD	Galv. Pipe		N/A	N/A	N/A	2.0'	1.75" x 9" Dia.		N/A			
Type C: Signs	2" Dia.	Galv. Pipe		N/A	N/A	N/A	18"	1.75" x 12" Dia.		N/A			
MAG DOT:													
Type 1: U Channel With 1, 2, or 3 Post		U Channel	2 or 3 lbs per SF	N/A	N/A	N/A	2.0'	Opt. Type B Fdn.		N/A	MAG 131	MAG DOT Detail 2038	MAG DOT Detail 2038
Type 2: Sq. Perf. Tube Post and Fdn.	2" x 2"	Square Perforated		21.5"	1 3/4" x 1 3/4"	2 1/4" x 2 1/4" x 24"	18" Min.	30" x 18" Dia. Conc.				MAG DOT Detail 2038	MAG DOT Detail 2038



MEMORANDUM

Date: 2/6/08

To: David Fern

From: Peter Kandarlis

Re: MAG Case 08-05 – Comments on Hazard Markers & Safety Posts

- There are no differences between safety post Types 1 & 2 except for height (MAG 42", Mesa 72"). Combine into a single detail and request that City of Mesa delete their safety post detail from M-62.4. Including wording from Mesa detail Note 8 that references their height for the specific use noted on the detail.
- The committee should discuss and arrive at a preferred safety post height. 36" to 42" are more typical heights by various agencies. Unified Facility Guide Specification and the Access Board only recommend a minimum 30" height for posts or bollards. AASHTO only recommends set backs, but no heights. Review of a number of agency specifications indicate that 36" high safety posts are typically used for access control and either 36" to 42" high safety posts are typically used for protecting structures (such as trash receptacles).
- Recommend excluding placement requirements for hazard markers. MAG details in this section define types and dimensions of features, not how or where they are used (unless there are regulatory requirements for use such as survey markers). The proposed additions require use of markers on raised objects and around down guys – not a generally accepted practice nor required by regulations. Agencies always retain the option to use safety posts, hazard markers, barricades, etc. where appropriate without a detail requiring specific placement in the MAG documents. SRP suggests that Chandler Details C-101 & C-102 be incorporated in the MAG details, but hat the City of Chandler retain their detail C-100 since this defines their preferred use of markers in their municipality.



February 6, 2008

To: MAG Standard Specifications and Details Committee

From: Jeff Van Skike, City of Phoenix

Subject: Modification to Section 618.3 Storm Drain Construction

This change will add leakage test procedures for HDPE storm drain pipes and require a video inspection before final paving is allowed.

Add to Section 618.3:

Leakage test for mainline HDPE storm drains.

For HDPE mainline storm drain pipe, the Engineer may require the Contractor to perform random leakage tests on the mainline. Field leakage tests, if requested, will be conducted in accordance with the following criteria:

- A. After bedding/backfill is completed to 1 foot above the pipe, the Engineer will select a minimum of three (3) joints of mainline pipe to be tested:
 1. Testing shall be accomplished by plugging the test section and all branch lines and filling the pipe with water. Equipment for the test shall be furnished by the Contractor, and shall include a standpipe and a suitable meter or other acceptable method of measuring the quantity of water used. A period of one (1) hour shall be allowed for absorption before making the test.
 2. The allowable water loss shall not exceed 1.0 gallon per hour per 100 linear feet of pipe per inch of pipe diameter under a minimum test head of 4 feet above the top of the pipe at the upper end of the test section. A minimum test time of one (1) hour shall be required after the initial one (1) hour for absorption.
 3. The leakage test shall be made by the Contractor in the presence of the Engineer.

- B. If the first test exceeds the specified leakage limit, the Contractor shall repair or replace all the sections that fail the leakage test at no additional cost to the agency. All repaired or replaced pipe sections shall be retested for compliance.
1. The Engineer reserves the right to require additional leakage tests deemed necessary during the course of construction to ensure that the remainder of the pipeline is leak resistant.
 2. There will be no separate payment for the leakage tests. Payment for leakage tests shall be included in the cost of the pipe.

Videotaping of new mainline storm drains.

Before final paving is installed over new HDPE mainline storm drain lines, the Contractor shall provide the Engineer with an annotated video inspection record (either VHS or DVD format) of the entire mainline storm drain pipeline and laterals. The video shall clearly show all joints, seals, connecting pipes, and manholes. This video shall be provided to the Engineer, and reviewed and approved by the Engineer prior to the Contractor being allowed to place the final pavement over the storm drain line. No separate payment will be made for this inspection; the cost of the video inspection shall be incidental to the contract cost.



Engineering

MEMORANDUM

DATE: February 5, 2008
TO: MAG Details and Specifications Committee
FROM: Gordon Haws, City of Mesa, Engineering Department *GH*
SUBJECT: Proposed Modifications to MAG Standard Specifications

In an effort to reduce the number of amendments/supplements to the MAG Standard Specifications that the various agencies (including Mesa) have, the City of Mesa presents the following proposed modifications to the MAG Standard Specifications for consideration. These items are currently Mesa amendments to the MAG specifications and could be eliminated by Mesa if incorporated into MAG.

These items may either be considered as a group (i.e., one case), or as individual cases.

1. Modifications to Section 109: *08-07*
 - a. Add the following paragraph immediately after the subsection title for Subsection 109.4:

All compensation due the Contractor for alteration of work, as outlined in this subsection, shall be documented by a Change Order.
 - b. Revise the second sentence of Subsection 109.4.6 to read as follows (additions denoted by underlining):

Additional compensation for other items, including extended overhead and conditions, shall not be considered or allowed.
2. Modifications to Subsection 301.3: *08-08*
 - a. Add the following text to the end of the first paragraph in Subsection 301.3:

All compaction shall be performed within 2 percent of the optimum moisture content.
 - b. Revise the table of required compactions in Subsection 301.3 to read as follows:

(A) All Streets.....	95 percent
(B) Other Traffic Ways.....	95 percent
(C) Curbs and Gutters.....	95 percent
(D) Sidewalks.....	90 percent

3. Modifications to Section 601 – Add the following paragraph immediately after the subsection title for Subsection 601.4:

For all compaction discussed in this section, moisture content shall be performed within 2 percent of optimum.

4. Modifications to Subsection 625.3.1 – Add the following additional verbiage before the paragraph that starts with “Frame and Cover...”: *08-09*

All manholes shall have a minimum of 6-inches and a maximum of 16-inches of approved adjusting rings.

All joints between shaft sections, cones and adjusting rings shall be sealed with “RAM-NEK” flexible gasket, mortar, or approved equal.

When a manhole is called out in the plans or in the specifications to be lined with a PVC liner, all exposed concrete surfaces including the shelf and opening shall be lined.

When manholes are placed within asphalt paved areas, the rings and covers shall be installed per MAG Standard Detail 422.



P.O. Box 52025
Phoenix, AZ 85072-2025
(602) 236-5900

Case # 08-10

DATE: February 6, 2008

TO: MAG Specifications and Details Committee Members

FROM: Peter Kandarlis, SRP Representative

RE: **Modifications Detail 200, Section 336 & Section 601: Trench Backfill and Pavement Replacement**

The attached detail and specification section revisions are proposed to reduce numerous agency exceptions to MAG trench backfill and pavement replacement standards (as requested by the MAG Standards & Details Consolidation Subcommittee).

A review of MAG agency supplemental details and specifications notes that nearly every entity takes some form of exception to standard utility trench backfill and pavement replacement requirements. A number of the exceptions tend to follow similar patterns and have been incorporated into the proposed modifications.

Detail 200 has been completely re-done. A summary document outlining the changes is also included as a "road map" to show items added, deleted or modified from the present detail. Modifications to Section 336 and 601 are also included to make changes more consistent and reduce duplication between the detail and the specification sections.

An evaluation of the various agency trench backfill and pavement replacement supplements was also performed. Changes with the MAG documents will require each agency to modify their standards to insure that supplemental details are removed. Suggested changes to each agency's supplements are provided to facilitate the process. Some agencies supplemental specifications will need only minor changes while others will need extensive revisions to retain repair preferences.

There was no attempt to make uniform the variations with asphalt pavement sections and material types used by different agencies. At present, these variations show a wide difference in engineering approach to pavement replacement. A table is attached that highlights the different approaches. It is recommended that this aspect of trench work be postponed to next year and that discussions be held over the next few months to come up with a more uniform engineering approach prior to proposing revised standards.

Summary of Changes to MAG Detail 200

Type A

- Recommended for longitudinal cuts
- Allows option of CLSM along with ABC for base
- AC section to be specified by special provisions or plans
- AC base and surface courses separately identified
- Includes new requirement for removal of 24" remnant between cut and curb
- References trench width to Sections 336 & 601

Type B (now referenced as "Type B Modified")

- Includes separate base – to match existing
- Allows backfill option of ABC, select & native along with CLSM
- References trench width to Sections 336 & 601
- 2" minimum AC thickness deleted. AC section to be specified by special provisions or plans
- AC base and surface courses separately identified

'T' Top (now referenced as "Type B")

- Recommended for transverse cuts
- Base shown separately. Allows option of CLSM along with ABC
- 1" minimum AC surface course deleted. AC section to be specified by special provisions or plans
- AC base and surface courses separately identified
- AC section to be specified by special provisions or plans
- Allows backfill options of select & native along with CLSM & ABC
- References trench width to Sections 336 & 601

Type C

- Edge sawcut included
- References trench width to Sections 336 & 601

Types D, E & F

- Combined into new Type D
- Recommended for trenches in ROW but not in paved roadway
- ABC base shown separately – to match existing if present instead of 9" per Note 4
- Defines backfill options to allow ABC, select, native or CLSM
- Surfacing to be specified by special provisions or plans – no minimums shown
- References trench width to Sections 336 & 601

New Type E

- Recommended for use in future roadway prism or alley
- Same as Type A, but with no pavement section

New Bedding Detail 1

- Identifies minimum cover over utility
- Bedding per Sections 101.2 and 601 or per utility specifications

Notes

- Original Note 1 moved to new bedding detail.
- Original Note 2 → New Note 1: modified, and references Section 336 (not 321) where all of the material requirements are noted.
- Original Note 3 → New Note 3: minimum trench width for slurry backfill increased from 18" to 24"; only CLSM allowed with cement content specified in special provisions, plans or by the engineer.
- Original Note 4 moved to Type D detail with thickness changed from 9" to matching existing.
- Original Note 5 included in New Note 2.
- New Note 2 requires base and backfill to be specified in special provisions or plans.
- New Note 4 references base, backfill & bedding compaction requirements to Section 601.
- New Note 5 requires AC base and surface course to be specified in special provisions, plans or the default in Section 336.2.4.1.
- New Notes 6 & 7 gives a summary of requirements in first paragraph of Section 336.3 that were deleted.
- New Note 8 provides for protection of copper and PE water pipes in CLSM.

<p>TYPE "A" LONGITUDINAL TRENCH (trench in pavement parallel to traffic)</p>	<p>TYPE "B" TRANSVERSE TRENCH (trench in pavement not parallel to traffic)</p>	<p>TYPE "B-MODIFIED" (trench in future roadway prism or alley)</p>
<p>TYPE "C" (trench in portland cement concrete pavement)</p>	<p>TYPE "D" (trench in right-of-way but not in paved roadway)</p>	<p>TYPE "E" (trench in future roadway prism or alley)</p>
<p>NOTES:</p> <ol style="list-style-type: none">1. PAVEMENT MATCHING AND SURFACE REPLACEMENT SHALL BE IN ACCORDANCE WITH SECTION 336.2. TYPE OF BACKFILL AND BASE SHALL BE AS SPECIFIED BY THE SPECIAL PROVISIONS, PLANS OR ENGINEER.3. TRENCHES LESS THAN 24" WIDE SHALL BE BACKFILLED FROM TOP OF BEDDING TO BOTTOM OF AC BASE COURSE OR ABC BASE (WHICHEVER IS APPLICABLE) WITH CLSM. CEMENT CONTENT SHALL BE SPECIFIED BY THE SPECIAL PROVISIONS, PLANS OR ENGINEER.4. BASE, BACKFILL AND BEDDING COMPACTION REQUIREMENTS SHALL BE IN ACCORDANCE WITH SECTION 801.5. A.C. BASE AND SURFACE COURSE TO BE AS SPECIFIED BY THE SPECIAL PROVISIONS, PLANS OR SECTION 336.2.4.1.6. INCLUDE 12" WIDE BASE LIPS SHOWN IN TYPE "B" AT LONGITUDINAL TRENCH ENDS, EXCEPT WHERE THE EDGE ABUTS EXISTING CONCRETE.7. USE TYPE "B" REPAIR WHENEVER A LONGITUDINAL TRENCH (TYPE "A") CROSSES A STREET OR GOES THROUGH AN INTERSECTION.8. COPPER OR POLYETHYLENE WATER PIPES EXPOSED IN TRENCHES TO BE BACKFILLED WITH CLSM SHALL BE WRAPPED WITH MIN 3/4" THICK CLOSED CELL FOAM INSULATION OR 3/4" WIDE BLACK INSULATION BEFORE PLACING CLSM.		
<p>BEDDING DETAIL 1</p>		
DETAIL NO. 200	STANDARD DETAIL ENGLISH	BACKFILL, PAVEMENT AND SURFACE REPLACEMENT
REVISED 2/6/08 DRAFT		DETAIL NO. 200

SECTION 336

PAVEMENT MATCHING AND SURFACING REPLACEMENT

336.1 DESCRIPTION:

Street and alley pavement and surfacing within the Contracting Agency's rights-of-way, removed by construction activities or to be widened or matched in connection with the improvement of Public Works, shall be placed as shown on the plans and applicable standard details, in accordance with this specification and/or the special provisions.

Asphalt concrete pavement replacement shall be constructed in accordance with Type A, B, ~~C or D~~ or ~~Standard Detail 200~~ Standard Detail 200 and on the plans, ~~and as required by Sections 336.2 and 336.4~~ roadway or B Modified _____ in the right-of-way but not in paved roadways _____ D of Standard Detail 200 and

Portland cement concrete pavement replacement shall be in accordance with Type C of the Standard Details, and as required by _____ 200

Sections ~~336.2 and 336.4~~ 336.2 and 336.4.

~~ABC or D or Standard Detail 200~~ surface replacement shall be constructed in accordance with Type ~~C or D~~ ~~as indicated in the Contracting Agency Special Provisions or~~ as indicated in the Contracting Agency Special Provisions or on the plans ~~and as required by Section 336.2~~ _____ herein

Temporary pavement replacement shall be constructed as required ~~below~~.

Pavements to be matched by construction of new pavements adjacent to or at the ends of a project shall be saw cut in accordance with these specifications and where shown on the plans.

Pavement and surfacing replacement within ADOT rights-of-way shall be constructed in accordance with their permits and/or specification requirements.

336.2 MATERIALS AND CONSTRUCTION METHODS:

Materials and construction methods used in the replacement of pavement and surfacing shall conform to the requirements of all applicable standard details and specifications, latest revisions.

336.2.1 Pavement Widening or Extensions: Existing pavements which are to be matched by pavement widening or pavement extension shall be trimmed to a neat true line with straight vertical edges free from irregularities with a saw specifically designed for this purpose. The minimum depth of cut shall be 1 1/2 inches or D/4, whichever is greater.

The existing pavement shall be cut and trimmed after placement of required ABC and just prior to placement of asphalt concrete for pavement widening or extension, and the trimmed edges shall be painted with a light coating of asphalt cement or emulsified asphalt immediately prior to constructing the new abutting asphalt concrete pavements. No extra payment shall be provided for these items and all costs incurred in performing this work shall be incidental to the widening or pavement extension.

The exact point of matching, termination, and overlay may be adjusted in the field, if necessary, by the Engineer or designated representative.

336.2.2 Pavement to be Removed: Existing asphalt pavement to be removed for trenches or for other underground construction or repairs shall be cut by a device capable of making a neat, straight and smooth cut without damaging adjacent pavement that is not to be removed. The Engineer's decision as to the acceptability of the cutting device and manner of operation shall be final. If saw cutting, only, is to be utilized, it will be so specified in the plans or special provisions.

In lieu of cutting trenches across driveways, curbs and gutters, sidewalks, alley entrances, and other types of pavements, the Contractor may, when approved by the Engineer, elect to tunnel or bore under such structures and pavements.

When installations are within the street pavement and essentially parallel to the center line of the street, the Contractor, with approval of the Engineer, may elect to bore or tunnel all or a portion of the installation. In such installations, the seal coat requirements, as discussed in Section 336.2.4, will be modified as follows:

SECTION 336

- (A) If the pavement cuts (bore pits, recovery pits, etc.) are 300 feet or more apart, the bore or tumbled distance will not be considered as part of the open trench and the seal coat may not be required.
- (B) If the pavement cuts (bore pits, recovery pits, etc.) are less than 300 feet apart, the distance between the cuts will be considered the same as a trench cut and the distance will be added to any trench cut distances.

336.2.3 Temporary Pavement Replacement: Temporary pavement replacement, as required in Section 601, may be with cold-mix asphalt concrete, with a minimum thickness of 2 inches, using aggregate grading in accordance with Section 710.

Temporary pavement replacement shall be used in lieu of immediate placement of single course permanent replacement or the first course of two course permanent replacement only on transverse lines such as spur connections to inlets, driveways, road crossings, etc., when required by the Engineer, by utilities or others who subcontract their permanent pavement replacement, under special prior arrangement, or for emergency conditions where it may be required by the Engineer. Temporary pavement replacement shall be placed during the same shift in which the backfill to be covered is completed.

Rolling of the temporary pavement replacement shall conform to the following:

- (A) Initial or breakdown rolling shall be followed by rolling with a pneumatic-tired roller. Final compaction and finish rolling shall be done by means of a tandem power roller.
- (B) On small areas or where equipment specified above is not available or is impractical, the Engineer will approve the use of small vibrating rollers or vibrating plate type compactors provided comparable compaction is obtained.

The surface of the temporary pavement shall be finished off flush with the adjacent pavement.

336.2.4 Permanent Pavement Replacement and Adjustments:

336.2.4.1 Permanent Pavement Replacement: Pavement replacement for cuts essentially parallel to the street centerline and greater than 50 feet in length shall be two course pavement replacement as hereinafter specified. For cuts greater than 600 feet in length the entire area shall then be seal coated in accordance with Section 330 (coated chips) or as otherwise specified. This seal coat shall extend from the edge of pavement or lip of gutter to the street centerline except that on residential streets less than 36 feet face to face of curb or where the pavement patch straddles the centerline, the entire width of street shall be seal coated.

In lieu of placing the seal coat as required previously, and with approval of the Contracting Agency, the Contractor may deposit with the Contracting Agency for credit to the Street Maintenance Department, a negotiated agreed upon amount. The Street Maintenance Department will incorporate this work into their street maintenance program.

Pavement replacement for cuts parallel to the street centerline less than 50 feet in length, transverse cuts, bell holes and similar small areas shall match gradation and thickness of the existing pavement. These one course pavement patches shall be compacted with a vibratory roller to the same density specified for asphalt concrete pavements.

Laying of single course or the base course of the asphalt concrete pavement replacement where a two course replacement is applicable shall never be more than 600 feet behind the ABC placed for the pavement replacement.

The trench must be compacted to its required density, and required ABC must be in place prior to the placement of the asphalt concrete.

Single course replacement shall consist of a 12.5 mm or 19 mm mix placed and finished as directed by the Engineer.

The base course of two course pavement replacement shall consist of a 19 mm mix in accordance with Section 710.

(336.2.4.1 rearranged – new text in green)

336.2.4.1 Permanent Pavement Replacement: Pavement replacement for longitudinal cuts (essentially parallel to the street centerline) greater than 50 feet in length and transverse cuts of any length shall be a two-course pavement replacement as specified in the Contracting Agency Special Provisions or on the plans. Pavement replacement for longitudinal cuts less than 50 feet in length, bell holes and similar small areas shall be a single course and match gradation and thickness of the existing pavement. These one-course pavement patches shall be compacted with a vibratory roller to the same density specified for asphalt concrete pavements.

If pavement replacement requirements are not noted on the plans or specified in the Contracting Agency Special Provisions, the following pavement replacement criteria will govern:

- (A) Single course replacement shall consist of a 12.5 mm or 19 mm mix in accordance with Section 710, placed and finished as directed by the Engineer.
- (B) The base course of a two-course pavement replacement shall consist of a 19 mm mix in accordance with Section 710.
- (C) The surface course of a two-course pavement replacement shall consist of a 9.5 mm mix in accordance with Section 710 and as specified by the Engineer to match the existing surface. The surface course shall not be placed sooner than 2 weeks after the base course, except where the trench crosses a signalized intersection. In this case the surface course shall be placed within 48 hours, or the crossing pavement replacement shall be a single course as specified above.
- (D) Where the base course is to be placed with non-compactive equipment, it shall be not less than 2 inches in thickness and the material shall be immediately rolled with a pneumatic-tired roller. The surface course shall be of sufficient depth to provide the total required compaction thickness of the two courses, but not more than 1 inch.

SECTION 336

~~Where the base course is to be placed with non-compactive equipment, it shall be not less than 2 inches in thickness and the material shall be immediately rolled with a pneumatic-tired roller. The surface course shall be of sufficient depth to provide the total required compacted thickness of the two courses, but not more than 1 inch.~~

~~Where the trench is 6 feet or more in width, all courses, single or both courses of the two course pavement replacement, shall be laid with a self-propelled compacting, spreading equipment. When the trench is from 6 to 8 feet in width, the self-propelled compacting, spreading equipment shall not be wider than 8 feet. All courses, except the surface course, shall be of a compacted thickness of not less than 1 1/2 inches.~~

~~The surface course shall consist of a 9.5 mm mix in accordance with Section 710 as specified by the Engineer to match the existing surface. The surface course shall not be placed sooner than 2 weeks after the base course, except where the trench crosses a signalized intersection. In this case the surface course shall be placed within 48 hours, or the crossing pavement replacement shall be single course as specified above.~~

~~Placement of the surface course is to be by means which will result in a surface texture satisfactory to the Engineer, and flush with the existing pavement.~~

~~Where deep lift asphalt concrete (asphalt concrete base and asphalt concrete wearing course) exists, the base course replacement shall be made in lifts not exceeding 6 inches in compacted thickness to within 1/2 inch of the finish grade.~~

~~336.2.4.2 Adjustments: When new or existing manholes, valves, survey monuments, clean outs, etc. fall within the limits of the permanent pavement replacement as discussed in this Section, the Contractor shall be responsible for adjusting the various items to the new pavement surface or as directed by the Engineer. This will include but not be limited to slurry and chip seals.~~

~~The Contractor will coordinate with the Engineer and with representatives of the various utilities regarding the adjustment and inspection of the work. The Contractor shall be responsible for obtaining and complying with all specifications, special requirements, details, etc. of the Utility Company regarding the adjustments. When adjusting the Agency's utilities, survey monuments, etc., the adjustment will comply with these Specifications and Details.~~

~~The work will be done in compliance with OSHA standards and regulations regarding confined space entry.~~

~~The Contractor shall remove all material attached to the lids and/or covers including that of prior work. The method of removal shall be approved by the Engineer and/or the Utility Representative.~~

336.3 TYPES AND LOCATIONS OF PAVEMENT AND SURFACING REPLACEMENT

~~Normally, the type of pavement replacement and backfill required will be noted on the plans or specified in other portions of the contract documents and construction will be in accordance with Detail 200. This detail requires that a 12-inch deep top be utilized when normal traffic flow is perpendicular to any one of the four sides of the trench excavation. Therefore, Type A pavement replacement will require a 12-inch deep top whenever the trench crosses a street or goes through an intersection and the width of the excavation is less than 6 feet. Type B pavement replacement will require the 12-inch deep top on the sides that are perpendicular to normal traffic flow.~~

~~If a type is not noted on the plans or specified in the special provisions, the following criteria will govern:~~

~~Type A pavement replacement ~~including the 12-inch deep top~~ will be utilized on all streets where the excavation is parallel to the centerline of the street. Use type B pavement replacement whenever a longitudinal trench crosses a street or goes through an intersection.~~

~~Type B pavement replacement ~~including the 12-inch deep top~~ will be utilized on all streets where the excavation is transverse to the centerline of the street.~~

~~Type C pavement replacement will be used to match existing portland cement concrete pavement.~~

~~Type D pavement replacement ~~may~~ be used when the condition of the existing pavement does not justify construction of Type A or B. Prior written approval of the Engineer is required. for this condition.~~

(E) Where the trench is 6 feet or more in width, all courses, single or both courses of the two-course pavement replacement, shall be placed with self-propelled spreading and compacting equipment. When the trench is from 6 to 8 feet in width, self-propelled spreading and compacting equipment shall not be wider than 8 feet. All courses, except the surface course, shall be of a compacted thickness of not less than 1 1/2 inches.

(F) Placement of the surface course is to be by means which will result in a surface texture satisfactory to the Engineer, and flush with the existing pavement.

(G) Where deep lift asphalt concrete (asphalt concrete base and asphalt concrete wearing course) exists, the base course replacement shall be made in lifts not to exceed 6 inches in compacted thickness to within 1/2 inch of the finish grade.

(H) The acceptable surface profile from the existing surface across a pavement replacement shall not vary more than 1/4 inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel or perpendicular to the centerline of the roadway. When the width of the pavement replacement is greater than 6 feet, compliance with the specification shall be measured by placing the straightedge a minimum of 4 feet overlapping the existing pavement.

Laying of single course or the base course of the asphalt concrete pavement replacement where a two-course replacement is applicable shall never be more than 600 feet behind the ABC placement for the pavement replacement.

The trench must be compacted to its required density, and required ABC must be in place prior to the placement of the asphalt concrete.

For cuts greater than 600 feet in length the entire area shall then be seal coated in accordance with Section 330 (coated chips) or as otherwise specified. This seal coat shall extend from the edge of pavement or lip of gutter to the street centerline except that on residential streets less than 36 feet face-to-face of curb or where pavement patch straddles the centerline, the entire width of street shall be seal coated.

In lieu of placing the seal coat as required previously, and with approval of the Contracting Agency, the Contractor may deposit with the Contracting Agency for credit to the Street Maintenance Department, a negotiated agreed upon amount. The Street Maintenance Department will incorporate this work into their street maintenance program.

Placed in Notes 6 and 7 in Detail 200

essentially longitudinal or
or at an angle

will be utilized to repair asphalt concrete, portland concrete and aggregate surfaces in the right-of-way, but not in paved roadways. It may also

SECTION 336

~~Type F pavement replacement will be utilized to match existing ABC or decomposed granite roadways.~~

Where a longitudinal trench is partly in pavement, the pavement shall be replaced to the outside edge of the existing pavement, on a straight line, as indicated on the plans. Measurements for payment shall be from the inner limit of pay width allowed below, to the outside edge of the existing pavement as defined herein.

Where no part of a trench is in pavement, surfacing replacement will only be specified where existing surfacing materials have been removed.

When a trench cut in aggregate surfaced area, the surfacing replacement shall be of a like type and depth as the existing material, compacted to the densities required in Section 601.

336.4 MEASUREMENT:

Measurement for payment and surfacing replacement shall be by the square yard, based upon actual field measurement of the area covered except as noted below.

(A) In computing pay quantities for replacement Types ~~A, B, and F~~, pay widths will be based on the actual field measured width, however the boundaries of the measurement will not extend further than 1/2 the distance, either side, from the centerline of the pipe as depicted on Table 601-1, Maximum Width At Top Of Pipe Greater Than O.D. Of Barrel.

(B) In computing pay quantities for replacement Types ~~C, D, E, and F~~, pay widths will be based on the actual field measured width, however the boundaries of the measurement will not extend further than 1/2 the distance plus 12 inches, either side, from the centerline of the pipe as depicted on Table 601-1, Maximum Width At Top Of Pipe Greater Than O.D. Of Barrel.

(C) Where a longitudinal trench is partly in pavement, computations of pay quantities shall be based on the limitations specified above.

(D) The length of pavement and surfacing replacement shall be measured through any manhole, valve box, or other structure constructed in the pipe line, and any pavement or surface replacement and/or seal treatment in excess of the above pay widths shall be considered and included in the bid item for such structure.

(E) Any pavement replacement in excess of the specified pay widths necessitated by the installation of valves, tapping sleeves and valves, valve by-passes, and concrete thrust blocks shall be included in the bid price for these items.

(F) When special provisions allow deviations from the trench widths specified in Section 601, the above allowed pay widths for pavement replacement may be altered where so specified.

(G) Measurement of pavement and surfacing replacement shall be made along the finished surface of the ground to the nearest foot, and shall be computed to the nearest square yard.

336.5 PAYMENT:

Direct payment for pavement or surfacing replacement will be made for replacement over all pipe trench cuts except as otherwise allowed in the special provisions. Payment for replacements over other work shall be included in the cost of constructing that work, in accordance with the applicable standard details and specifications.

Payment for temporary pavement replacement shall be included in the cost of the pipe.

When a Contractor has the option of either jacking and/or boring or open cut construction, and elects to construct a pipeline by the jacking and/or boring method, he will be paid for the replacement of such items of work as pavement, curb and gutter, sidewalk, driveway, and alley entrances, as allowed for open cut construction.

End of Section

SECTION 601

The Contractor shall be entirely responsible for safeguarding and maintaining all conflicting utilities that are shown on the plans (Sections 107 and 105 apply). This includes overhead wires and cables and their supporting poles whether they are inside or outside of the open trench. If, in the course of work, a conflicting utility line that was not shown on the plans is discovered, the Contracting Agency will either negotiate with the owner for relocation, relocate the utility, change the alignment and grade of the trench or as a last resort, declare the conflict as "extra work" to be accomplished by the Contractor in accordance with Section 104.

601.3.2 Irrigation Ditches, Pipes and Structures: The Contractor shall contact the owners of all irrigation facilities, and make arrangements for necessary construction clearances and/or dry-up periods.

All irrigation ditches, dikes, headgates, pipe, valves, checks, etc., damaged or removed by the Contractor, shall be restored to their original condition or better, by the Contractor at no additional cost to the Contracting Agency.

601.3.3 Building, Foundations and Structures: Where trenches are located adjacent to building, foundations, and structures, the Contractor shall take all necessary precaution against damage to them. The Contractor shall be liable for any damage caused by the construction.

Except where authorized in the special provisions or in writing by the Engineer, water settling of backfill material in trenches adjacent to structures will not be permitted.

601.3.4 Permanent Pipe Supports: Permanent pipe supports for the various types and sizes of sewer, water and utility lines shall conform to the Standard Details or the details shown on the plans. Such pipe supports shall be erected at the locations shown on the plans and/or at any other locations as necessary as determined by the Engineer.

601.3.5 Electronic, Telephonic, Telegraphic, Electrical, Oil and Gas Lines: These underground facilities shall be adequately supported by the Contractor. Support for plastic pipes shall be continuous along the bottom of the pipe. Support for metal pipe and electrical conduit may be continuous or nylon webbing may be used for suspension at no greater than ten-foot intervals.

The Contractor shall avoid damaging the plastic pipe, pipeways or conduits during trench backfilling and during foundation and bedding placement.

There will be no measurement or payment for this work. The Contractor will include all associated costs in the unit bid price for the conduit installation.

601.4 FOUNDATION, BEDDING, BACKFILLING AND COMPACTION:

601.4.1 Foundation: The material upon which the conduit or structure is to be placed shall be accurately finished to the grade or dimensions shown on the plans or as directed by the Engineer. The bottom portion of the trench shall be brought to grade so that the conduit or structure will be continuously in contact with the material on which it is being placed. If rocky or unsuitable soil is encountered, Subsection 601.2.5 applies.

601.4.2 Bedding: Bedding shall consist of granular material containing no pieces larger than 1 1/2 inches and free of broken concrete, broken pavement, wood or other deleterious material. Open graded rock will not be used without the written approval of the Engineer.

Where water consolidation is used, bedding for conduits, 24 inches or less in I.D., may be placed in one lift. For larger conduits the first lift shall not exceed the springline of the pipe.

Where mechanical compaction is used, the moisture content shall be such that the specified compaction can be obtained. The first lift shall be 8 inches or two-thirds of the distance to the springline whichever is greater. Succeeding lifts shall not exceed 2 feet loose and extreme care will be taken to prevent damage to or movement of the conduit by the compaction equipment.

601.4.3 Backfill: Backfill shall be sound earthen material free from broken concrete, broken pavement, wood or other deleterious material. Unless otherwise specified, this may be native material with no pieces larger than 4 inches, select material or aggregate base course. Backfill under street pavement shall be constructed per Detail 200 with the type of replacement noted on the plans

Recycled or reclaimed asphalt concrete shall not be used.

Recycled or reclaimed asphalt concrete shall not be used.

SECTION 601

or in the special provisions. Unless otherwise noted, backfill under single curb, curb and gutter, sidewalk, driveways, valley gutters, etc. shall be the same as the adjacent street pavement.

Where water consolidation is used, backfill will be placed in lifts as required in the following table prior to settlement.

Trench Width	Backfill Lifts
18" to 24"	Not to exceed 4'
25" to 36"	Not to exceed 6'
Over 36"	Not to exceed 8'

The above backfill lift limitations are not applicable when water saturation is done by the jetting method.

Where mechanical compaction is used, backfill shall be placed in lifts the height of which shall not exceed that which can be effectively compacted depending on the type of material. Type of equipment and methods used, and under no circumstances shall exceed 4 feet.

Backfill, around utilities that are exposed during trench excavation, shall be placed in accordance with the bedding methods.

601.4.4 Compaction Densities: Unless otherwise provided in the plans and/or special provisions, the trench backfill shall be thoroughly compacted to not less than the densities in Table 601-2 when tested and determined by AASHTO T-99 and T-191 or ASTM D-2922 and D-3017. When AASHTO T-99, method A or B, and T-191 are used for density determination, MAG Detail 190 will be used for rock correction.

The density required will depend on the Type shown on the plans and/or called for in the special provisions. Density required for each type shall comply to Table 601-2.

TABLE 601-2 MINIMUM TRENCH COMPACTION DENSITIES				
Backfill Type	Location	From Surface To 2 feet Below Surface	From 2 feet Below Surface To 1 foot Above Top of Pipe	From 1 foot Above Top of Pipe to Bottom of Trench
I	Under any existing or proposed pavement, curb, gutter, sidewalk, or such construction included in the contract, or when any part of the trench excavation is within 2' of the above.	100% for granular 95% for non-granular	90%	90%
II	On any utility easement street, road or alley right-of-way outside limits of (I).	85%	85%	90%
III	Around any structures or exposed utilities.	95% in all cases		

Note: The type required will generally be shown on the plans and the plans will govern. Where no type is shown on the plans the type shall comply with Table 601-2.

A consideration in determining the backfill Types as shown on the plans, is based on the trench widths as shown in the Contract Documents. If these trench widths increase beyond those widths referred to above and fall within the 2-foot limit of paved surfaces and other improvements due to construction exigencies, the backfill designation for that portion within the 2-foot limit of such improvements shall be Type I even though Type II backfill is shown on the plans.

Utilities installed within a future roadway prism or within an unsurfaced alley shall be in accordance with Type E of Standard Detail 200 or as indicated in the Contracting Agency Special Provisions or as indicated on the plans.

City of Apache Junction

Below are the special provisions needed by Apache Junction when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. Apache Junction Detail G-3200 is very similar to pre-2002 MAG Detail 200. It is recommended that this detail be eliminated in lieu of the proposed changes to the MAG detail. Clarifications can be included in Apache Junction's Engineering Design Guidelines and Policies Manual.

- The following is required for all utilities to be installed under existing pavement.
 - Use Type B-Modified repairs per MAG Detail 200.
 - Remove and replace an additional 12" width of pavement on both sides of trench.
 - Trench base and backfill shall be 1-sack CLSM in accordance with MAG 728.
 - Asphalt concrete shall be a single course of A12.5-mm per EVAC, 2-inch minimum thickness or match existing, whichever is greater.
- Use Type B repairs for trenches that are not parallel to the center line of the street. Otherwise, use Type B-Modified trench repairs. Base and backfill shall be aggregate base course (ABC) per MAG Sections 702 and 601.
- Trench base and backfill shall be 1-sack CLSM in accordance with MAG 728 for all trenches under pavement and wash crossings.
- Replacement shall match existing pavement thickness and gradation. Minimum 2-inch thickness for single course pavements. Maximum 1-inch thickness of surface course over adequate base course to match existing thickness with two-course pavements.

Replace Apache Junction's Engineering Design Guidelines and Policies Manual Sections 2.15(I) and 2.16(D) with the following:

- Trench backfill, pavement and surface replacement shall be done in accordance with MAG Section 336 and Detail 200, except as noted herein.

The Apache Junction detail also includes a trench plating cross section. MAG Detail 211 incorporates more specific information. An exception to this detail can be included in Apache Junction's Engineering Design Guidelines and Policies Manual noting the following:

- Trench steel plating shall be done in accordance with MAG Detail 211. Place bump signs at all steel plate crossings.

City of Avondale

There are no additional special provisions needed by Avondale when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. Avondale does not have a separate standard detail for pavement repair. Unless otherwise discussed, exceptions presently noted are compatible with the proposed revisions.

Clarifications to pavement replacement requirements are included in the Avondale Engineering Department document titled "Construction Permit Special Provisions For Utility Work" dated September, 2005. It is recommended that the first sentence in Note 12 be revised as follows to be consistent with proposed revision language:

Pavement replacement for open cut trenching, transverse and longitudinal, in any existing paved street, shall be in accordance with MAG Detail No. 200, Type B, ~~with "T"-Top construction.~~

City of Chandler

Below are the special provisions needed by Chandler when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. These requirements can be included in Chandler Specification No. 3 in the City of Chandler Standard Specifications in lieu of Detail C-110.

- Use Type B repairs per MAG Detail 200 for all utility trenches, with remnant removal as noted in detail for Type A trench repair.
- Trench backfill shall be ½-sack CLSM in accordance with MAG 728.
- For large excavations, the City Engineer may allow full depth ABC (MAG 702.2) compacted in accordance with MAG Table 601-2 (Type 1 backfill) at trench backfill instead of ½-sack CLSM.
- Base shall be aggregate base course (ABC) per MAG 702.2 compacted in accordance with MAG Table 601-2 and placed in maximum 8 inch lift thicknesses.
- Place backfill and compact shelf area prior to placing base course.
- For trenches in arterial, collector and industrial streets:
 - Base course thickness shall be increased from 12" to 16"
 - Remove and replace an additional 12" width of pavement on both sides of trench
 - Asphalt concrete base course shall be 2-1/2" thick A19-mm per EVAC
 - Asphalt concrete surface course shall be 1-1/2" thick A12.5-mm per EVAC
- For trenches in all other streets, pavement section shall be 2-1/2" thick A19-mm per EVAC.
- Where patches are located in streets surfaced with rubberized asphalt, a rubberized asphalt mix design shall be submitted to the City Engineer for approval prior to installation.

Town of Gilbert

Below are the special provisions needed by Gilbert when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. These requirements can be added to the specifications already noted in Section 4.7 titled "Trenching/Backfill Standards" in the Town of Gilbert Public Works and Engineering Standards and Details in lieu of Detail 45 (note: Gilbert may need to retain the part of Detail 45 that pertains to manhole adjustments).

- Trench backfill, pavement and surface replacement shall be done in accordance with MAG Section 336 and Detail 200, except as noted herein.
- Full depth 1-sack CLSM per MAG Section 728 may be used in lieu of compacted native backfill with Town Engineer's approval.
- For transverse trenches, base course under pavement shall be Class "B" concrete per MAG Section 725. Concrete shall at least match existing base course thickness, but not be less than 8-inches in depth and shall extend a minimum of 6 inches beyond the trench width on each side.
- 1-sack CLSM per MAG Section 728 shall be used as base in lieu of Class "B" concrete if 1-sack CLSM is used as trench backfill.
- Pavement section shall match existing pavement, but not be less than 4 inches in thickness and be placed in two lifts using a surface and base course mix per East Valley Asphalt Committee recommendations. Pavement replacement shall extend a minimum of 12 inches beyond the base course width on each side.

Revise the second paragraph in 4.7 as follows (details note bedding, not trenching and backfill):

Town of Gilbert Standard Details for ~~bedding, trenching and backfill~~ are shown in the following illustrations in:

The following additional recommendations are also offered for consideration:

- Revise use of a Class B concrete cap over utility trenches backfilled with native soil to allow aggregate base course that is more compatible with the adjacent soil modulus. High elastic modulus differences between subgrade elements can result in differential settlement and subsequent pavement cracking.
- The backfill notes in Gilbert Details 84, 85, 86 & 87 reference compaction in accordance with MAG 601. Table 601-2 in the MAG section is not in agreement with the compaction requirements of Gilbert's special provisions in the first paragraph in Section 4.7 (MAG requires 90% to within 2 feet of subgrade, Gilbert requires 90% to within 3 feet of subgrade plus includes optimum moisture guidelines). Suggest that the details reference Town of Gilbert special provisions and delete MAG reference.

City of Glendale

There are no additional special provisions needed by Glendale when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. Proposed changes include all requirements in Glendale Standard Detail G-319, thus allowing removal of this detail

The following additional recommendations are also offered for consideration:

- Glendale's Engineering Design and Construction Standards provide foundation, bedding and backfill material and compaction requirements for all wet utilities in the applicable technical design requirements, but do not include similar requirements for dry utilities. It is suggested that base and backfill material options be included in this document for dry utilities (foundation and bedding are typically done in accordance with the dry utility's standards). Either MAG Section 601 compaction requirements can be used (without exception taken) or additional compaction requirements will be needed in these Glendale standards.

City of Goodyear

Below are the special provisions needed by Goodyear when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. Goodyear Detail G-3200 is very similar to pre-2002 MAG Detail 200. It is recommended that this detail be eliminated in lieu of the proposed changes to the MAG detail. Backfill and base material clarifications can be included in Goodyear's Engineering Design Standards and Policy Manual.

- Trench backfill, pavement and surface replacement shall be done in accordance with MAG Section 336 and Detail 200, except as noted herein.
- For Type B and B-Modified trench repairs, base and backfill shall be aggregate base course (ABC) per MAG Sections 702 and 601.

Maricopa County Department of Transportation

There are no additional special provisions needed by MCDOT when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. MCDOT does not have a separate standard detail for pavement repair. Exceptions presently noted are compatible with the proposed revisions.

City of Mesa

Below are the special provisions needed by Mesa when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. These requirements can be included in Section S of Mesa Standard Specifications in lieu of Details M-19.4, sheet 1 of 2 and Detail M-19.5.

- Trench backfill, pavement and surface replacement shall be done in accordance with MAG Section 336 and Detail 200, except as noted herein.
- Remnant removal as noted in detail for Type A trench repair shall be 36 inches.
- For Type A trench repairs, base shall be aggregate base course (ABC) per MAG 702.2. Trench backfill and bedding shall be either granular material or non-granular native material per MAG 601 and 702.
- For Type A trench repairs, asphalt concrete base course width shall match the trench width.
- For Type B trench repairs, base shall be either aggregate base course (ABC) per MAG 702.2 or 1-sack CLSM in accordance with MAG 728. Trench backfill and utility bedding shall be 1-sack CLSM in accordance with MAG 728.
- Compaction shall be in accordance modified Table 601-2 as shown in Section W.
- Measurement for payment shall be per MAG Section 336.4 except for pay width. All pay widths shall be computed per Section 336.4 and shall be only for the trench width as shown in MAG Detail 200, unless otherwise noted on the plans or special provisions. Note: No payment will be made for additional pavement replacement as a result of a wider trench excavation.

Detail M-19.4, sheet 2 of 2 can be deleted, with notes incorporated in Mesa Standard Specs:

- Notes 1, 3, 4, 8 and 10 can be placed in Section S.
- Note 2 is already in Section W.
- Notes 5 and 7 are incorporated with the exceptions shown above.
- Note 6 is already in Section S.
- Note 9 is not an exception to any MAG requirement (if determined as necessary, could be placed in Section S).
- Note 11 can be placed in Section W.

Modified Table 601-2 (to be placed in Section W of Mesa Standard Specifications):

MINIMUM TRENCH COMPACTION DENSITIES				
Backfill Type	Location	From Surface to 2' Below Surface	From 2' Below Surface to 1' Above top of Pipe	From 1' Above Top of Pipe to Bottom of Trench
I	Under any existing or proposed pavement, curb, gutter, sidewalk, or such construction included in the contract, or when any part of the trench excavation is within 2' of the above, or within future or new roadway prisms and alleys.	Granular: 100% Non-Granular: 95%	Granular: 100% Non-Granular: 95% (1)	Granular: 100% Non-Granular: 95%
II	On utility easement in street or road right-of-way outside limits of I.	85%	85%	90%
III	Around any structure or exposed utilities.	95% in all cases		

(1) 90% for trenches within future or new roadway prisms and alleys

City of Peoria

There are no additional special provisions needed by Peoria when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. Peoria does not have a separate standard detail for pavement repair. Unless otherwise discussed, exceptions presently noted are compatible with the proposed revisions.

It is recommended that Note 3 of the section titled "Trench Backfill and Pavement Replacement" in City of Peoria Engineering Memorandum titled "Utilities/Contractors/Subcontractors Requesting to Work in the City of Peoria Right-of-way," dated February 25, 2002, be revised as follows:

3. Pavement thickness shall be 1.5 times the existing thickness. Pavement shall be replaced per M.A.G. Standard Detail 200 *Type B* (~~"T-top"~~) with the exception that all backfill shall be $\frac{1}{2}$ sack CLSM in accordance with MAG 728 ~~ABC slurry~~.

City of Phoenix

Below are the modifications to special provisions needed by Phoenix when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. These modifications can be done in the City of Phoenix Supplement to MAG Section 336 in lieu of Detail P1200.

It is recommended that Phoenix Supplement Section 336.3 be revised as follows:

Normally, the type of pavement replacement and backfill required for the trench excavation will be noted on the plans or specified in the special provisions and construction will be in accordance with *MAG Detail 200*. ~~City of Phoenix Supplement to MAG Detail P-1200.~~

For trenches up to 24 inches wide, CLSM may be used up to the replacement pavement subgrade level. For trenches between 24 inches and 6 feet wide, CLSM shall only be placed in the top 24 inches of trench. For trenches wider than 6 feet, CLSM backfill shall not be used. CLSM shall be $\frac{1}{2}$ -sack cement in accordance with MAG 728

(A) Unless otherwise specified, *MAG Detail 200, Type B transverse trench repairs* ~~the "T" top as shown in City of Phoenix Supplement to MAG Specs Detail P-1200~~ will not be required within the City of Phoenix. If the project extends into another municipality/county *Type B* ~~the "T" top~~ may be required for that portion of the project. *Base and backfill for Type B shall be either aggregate base course (ABC) per MAG 702.2 or 1/2-sack CLSM in accordance with MAG 728.*

(B) When the trench excavation is not being accomplished in conjunction with a paving project, the following backfill and pavement replacement requirements apply:

(1) *Use Type B-Modified repairs per MAG Detail 200.*

(2) *When the trench is transverse (45 to 90 degrees to street centerline) or when a longitudinal trench crosses a major street, collector street or any other signalized intersection, the backfill material required by Detail P-1200 for Type B shall be used. base and backfill shall be either aggregate base course (ABC) per MAG 702.2 or 1/2-sack CLSM in accordance with MAG 728. Permanent trench pavement replacement is required.*

(32) When the trench is parallel or less than 45 degrees to the street centerline, ~~the backfill material required by Detail P-1200 for Type A shall be used.~~ base and backfill shall be aggregate base course (ABC), granular material or native soil per MAG 702 and 601, or 1/2-sack CLSM in accordance with MAG 728. Permanent trench pavement replacement is required.

~~(3) When the trench crosses a major street, collector street, or any other signalized intersection, the backfill materials required by Detail P-1200 for Type B shall be used. Permanent trench pavement replacement is required.~~

(C) When the trench excavation is being accomplished in conjunction with a paving project ~~the following backfill and pavement replacement requirements apply: permanent pavement replacement is not required.~~

~~(4) When the trench is transverse (45 to 90 degrees to street centerline) the backfill material required by Detail P-1200 for Type B will be used. Permanent pavement replacement is not required.~~

~~(2) When the trench is parallel or less than 45 degrees to the street centerline, the backfill material required by Detail P-1200 for Type A shall be used. Permanent trench pavement replacement is not required.~~

~~3) When the trench crosses a major street, collector street, or any other signalized intersection, the backfill material required by Detail P-1200 for Type B shall be used. Permanent trench pavement replacement is not required.~~

~~(4)~~ Temporary pavement replacement (MAG 336.2.3) will be required at intersections for traffic control and at existing partial paved areas when the total pavement is not scheduled for immediate removal and replacement. In addition to the above, the Engineer may require temporary pavement at any area where public safety and welfare warrants. This will be a non-pay item considered incidental to the project.

~~(5)~~ If the excavation extends beyond the limits of the paving project, the Contractor shall provide permanent trench pavement replacement in accordance with paragraph (B) for this extension.

(D) Use Type C repairs per MAG Detail 200 ~~W~~ when the trench excavation is made in Portland cement concrete pavement, ~~Detail P-1200 Type C backfill and pavement replacement applies.~~

(E) When the condition of the existing pavement does not justify the use of MAG Detail 200 ~~Detail P-1200, Type A or Type B-Modified repairs backfill~~, Type D backfill and pavement replacement shall apply. *Backfill shall be compacted native soil.* Written approval from the Engineer shall be required.

(F) When the trench excavation is made in ABC or decomposed granite pavement, MAG Detail 200 ~~Detail P-1200 Type E~~ D backfill and pavement replacement shall apply. *Backfill shall be compacted native soil (no base required). Surfacing replacement shall be at least 4 inches thick.*

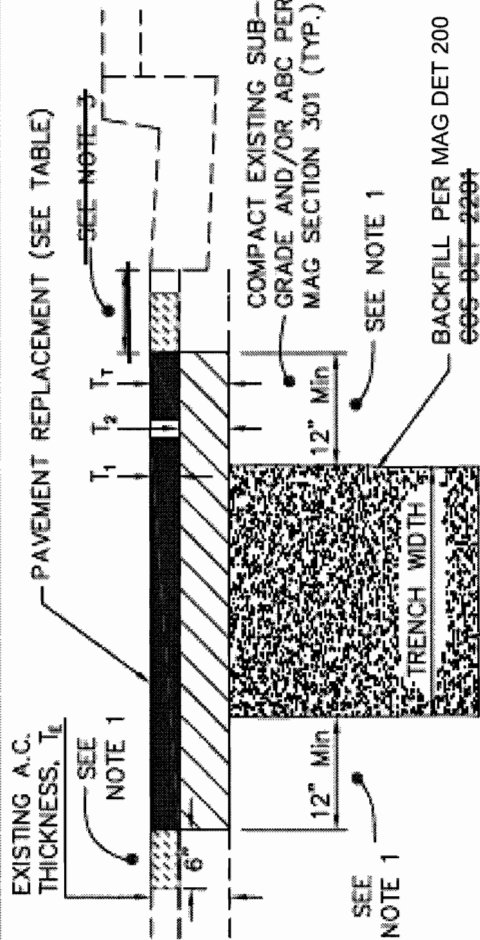
City of Scottsdale

Below are the modifications to special provisions needed by Scottsdale when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. These modifications can be done in the City of Scottsdale Supplement to MAG Section 336 in lieu of COS Detail 2201. COS Detail 2000 includes extensive pavement section replacement requirements and should be modified (as attached) to delete duplication of trenching requirements in proposed MAG Detail 200.

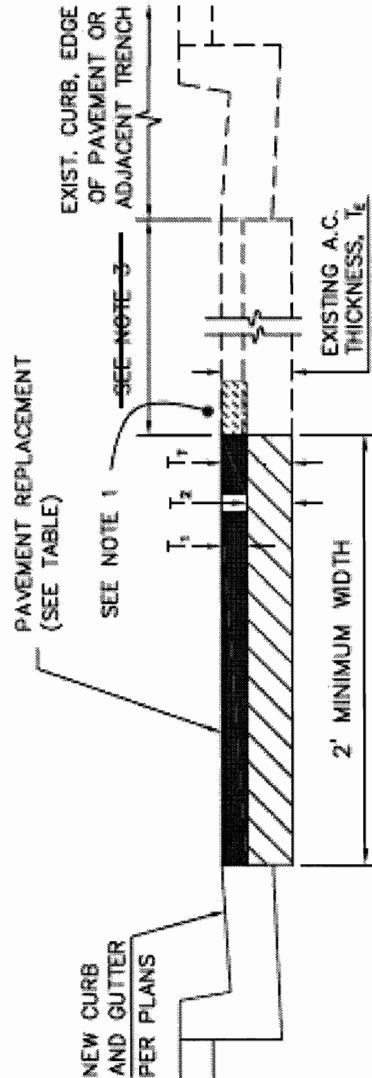
- Trench backfill, pavement and surface replacement shall be done in accordance with MAG Section 336 and Detail 200, except as noted herein.
- Use Type A repairs per MAG Detail 200 as modified below for all utility trenches under existing and future pavement.
- Any pavement remnant 36 inches or less in width between edge of pavement replacement and existing curb, edge of pavement or edge of existing adjacent trench cut shall be removed and replaced.
- When specified as backfill, use ½ -sack CLSM in accordance with MAG 728.
- Unless otherwise specified, base layer shall be aggregate base course (ABC) per MAG 702.2.
- Trench backfill for Type A repairs shall be as follows:
 - a) Trenches less than 24 inches in width shall be backfilled from bedding to the bottom of the base layer with CLSM or to 6 inches below pavement in full depth pavement.
 - b) Trenches 24 inches to 6 feet in width shall be backfilled from bedding to the bottom of the base layer with either granular material or non-granular native material per MAG 601.4.3. Base layer shall be CLSM.
 - c) Trenches over 6 feet in width shall be backfilled with either granular material or non-granular native material per MAG 601.4.3.
- Use Type D repairs per MAG Detail 200 for all utility trenches under unpaved roadways, parking lots and vacant land. If ABC base layer is present, place a minimum 12-inch thickness. Backfill shall be either granular material or non-granular native material per MAG 601.4.3.
- For all unpaved roadways, lots and alleys, treat the entire disturbed surface with lignin-based dust palliative in accordance with MAG 792, 1:1 dilution ratio, 0.50 gal/sy application rate.
- Bedding shall be per MAG Detail 200 as modified by COS Supplemental Specification Section 601.4.2. CSLM shall not be used as bedding for water or sewer pipe.
- Bedding for HDPE pipe shall be per COS Supplemental Specification Section 603.4.2.

It is recommended that Scottsdale Supplement Section 336.2.4 be deleted as this paragraph has been included in revisions to MAG Section 336.

EXISTING PAVEMENT THICKNESS, T_E	AC PAVEMENT REPLACEMENT TABLE		
	AC SINGLE COURSE OR SURFACE COURSE, T_1	AC BASE COURSE, T_2	TOTAL THICKNESS, T_T
$T_E \leq 3"$	3" MINIMUM	NONE	3" MINIMUM
$T_E > 3"$	2" MINIMUM	2" MINIMUM	T_E (MATCH EXIST)



PAVEMENT REPLACEMENT FOR TRENCHES (T-TOP)



PAVEMENT REPLACEMENT

1. "T"-TOP REQUIRED FOR ALL TRENCHES. A.C. SURFACE COURSE REPLACEMENT TO BE MILLED DOUBLE "T" CONFIGURATION AS SPECIFIED BELOW FOR PAVEMENTS 4" AND THICKER.
 - a. FOR PAVEMENT 4 YEARS AND OLDER: INITIAL A.C. REMOVAL TO BE THE MINIMUM WIDTH REQUIRED FOR PROPER TRENCH COMPACTION. SAWCUT & REMOVE 12" OF A.C. MINIMUM ON EACH SIDE OF THE TRENCH FOR THE "T"-TOP AFTER THE BACKFILL MATERIAL IS PLACED. PAVEMENTS 4" AND THICKER, MILL AND REMOVE THE TOP 2" OF THE SURFACE COURSE A MINIMUM OF 6" ON EACH SIDE OF THE T-TOP PRIOR TO PLACEMENT OF THE FINAL SURFACE COURSE LIFT.
 - b. FOR NEW AND OVERLAYED PAVEMENT LESS THAN 4 YEARS OLD AND WHEN ALLOWED UNDER THE PROVISIONS OF SCOTTSDALE REVISED CODE SECTIONS 47-79 AND ALL PAVEMENTS WITH RUBBERIZED SURFACE COURSES: INITIAL A.C. REMOVAL TO BE THE MINIMUM WIDTH REQUIRED FOR PROPER TRENCH COMPACTION. SAWCUT & REMOVE 12" OF A.C. MINIMUM ON EACH SIDE OF THE TRENCH FOR THE "T"-TOP AFTER THE BACKFILL MATERIAL IS PLACED. PAVEMENTS 4" AND THICKER, MILL AND REMOVE THE TOP 2" OF THE SURFACE COURSE A MINIMUM OF 6" ON EACH SIDE OF THE T-TOP PRIOR TO PLACEMENT OF THE FINAL SURFACE COURSE LIFT.
2. ASPHALT CONCRETE SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF MAG SECTION 324.
3. IF PAVEMENT REMAINT IS LESS THAN 36", REMOVE AND REPLACE PAVEMENT AS PER THIS DETAIL.
4. AGGREGATE BASE COURSE PER MAG SECTION 702 SHALL BE PROVIDED TO MATCH EXISTING A.C. THICKNESS IN ADJACENT ROADWAY.
5. REFER TO 605 SUPPLEMENTAL SPECIFICATIONS, SECTION 330.2.4 FOR PAVEMENT SMOOTHNESS REQUIREMENTS.

DETAIL NO.	City of Scottsdale Standard Details	PAVEMENT REPLACEMENT	DETAIL NO.
2200			2200

2. EXCEPT AS REVISED ABOVE, PAVEMENT MATCHING AND SURFACE REPLACEMENT SHALL BE IN ACCORDANCE WITH MAG 336.

City of Tempe

Below are the special provisions needed by Tempe when using proposed MAG Detail 200, revised MAG Section 336 and existing MAG Section 601. These modifications can be done in the City of Tempe Supplements to MAG Standard Specifications in lieu of COT Detail T-450.

- Trench backfill, pavement and surface replacement shall be done in accordance with MAG Section 336 and Detail 200, except as noted herein.
- When specified as backfill, use ½ -sack CLSM in accordance with MAG 728.
- Use Type A repairs per MAG Detail 200 as modified below for longitudinal trenches.
 - a) Base layer shall be aggregate base course per MAG 702.2 at least 12 inches in depth or matching existing, whichever is greater.
 - b) Backfill shall be CLSM from top of bedding to the bottom of the base layer.
- Use Type A repairs per MAG Detail 200 as modified below for transverse trenches.
 - a) Base and backfill shall be CLSM from top of bedding to the bottom of the pavement section.
- Sawcut and remove asphalt concrete pavement to match trench width.
- Asphalt concrete base course thickness and type shall be as described in COT Details T-311, T-312, T-313, T-314, T-315, T-316 and T-317, or match existing pavement thickness, whichever is greater.
- After completion of trench backfill and base course pavement replacement, sawcut asphalt concrete 2 inches deep at an additional 12-inch distance parallel to and on both sides of trench cut. Rotomill and remove asphalt concrete 2 inches deep between sawcuts. Place by laydown machine new 2-inch thick A12.5-mm asphalt concrete surface course.
- Use of steel plates (per MAG Detail 211) shall not exceed 72 hours prior to final pavement placement.

It is recommended that Tempe adopt MAG 728 Controlled Low Strength Material in lieu of Lean Mix Backfill specified in COT Detail T-450.

Pavement Replacement Standards by MAG Agencies

Agency	AC Standard	AC Thickness and Type (by street type)					
		Arterial/Major Collector		Industrial		Local/Residential/Minor Collector	
		AC Base Course	AC Surface Course	AC Base Course	AC Surface Course	AC Base Course	AC Surface Course
MAG standards	MAG	For all street types: Match existing pavement thickness, 2" min. 12.5-mm or 19-mm for single course, 1" max. 9.5-mm surface course over 2" min. 19-mm base course with two-course pavements					
Apache Junction	EVAC	For all street types: Match existing pavement thickness, 2-1/2" min. 12.5-mm for single course, 1" max. surface course over 2" min base course with two-course pavements					
Avondale	Superpave & COP	3" min, 19-mm	2" 12.5-mm	-----	-----	3" 19-mm or 3" C-3/4" COP	-----
Chandler	EVAC	2-1/2", A19-mm	1-1/2", A12.5-mm	2-1/2", A19-mm	1-1/2", A12.5-mm	2-1/2", A12.5-mm	-----
Gilbert	EVAC	For all street types: Match existing pavement with two-course pavement, minimum 4" total thickness					
Glendale	Superpave	For all street types: Match existing pavement thickness with 9.5-mm or 12.5-mm AC, maximum 2-1/2" lifts					
Goodyear	MAG	(same as MAG standards)					
MCDOT	MAG	(same as MAG standards)					
Mesa ⁽¹⁾	EVAC	4" min, A19-mm	(See Note 1)	3" min, A19-mm	(See Note 1)	2-1/2" min, R25-mm	(See Note 1)
Peoria	MAG	For all street types: 1.5 times existing pavement thickness					
Phoenix	MAG & COP	For all street types: In accordance with plans or special provisions					
Scottsdale ⁽²⁾	EVAC	For all street types: If existing pavement is ≤ 3", place 3" min AC thickness, match existing type If existing pavement is > 3" place 2" min AC base course under 2" AC surface course, match existing types/thickness					
Tempe ⁽³⁾⁽⁴⁾	EVAC	4" min, A25-mm	2", A12.5-mm	4" min, A25-mm	2", A12.5-mm	2-1/2" min, R19-mm	-----

⁽¹⁾ After full depth AC base course patch has been subjected to traffic 2-3 weeks, mill out 1 1/2" & place R12.5 or A12.5 AC surface course

⁽²⁾ Pavements 4" and thicker, mill & remove upper 2" prior to final placement of surface course – width varies with pavement age

⁽³⁾ Multi-family & Residential Collectors – Place 3" min A19 base course under 2" A12.5 surface course

⁽⁴⁾ Rotomill & remove upper 2" prior to final placement of surface course